TEXAS AGRICULTURAL EXPERIMENT STATION
R. D. LEWIS, Director, College Station, Texas

Bulletin 720

The Cleaning of Mechanically Harvested Cotton

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March 1950

The TEXAS AGRICULTURAL AND MECHANICAL COLLEGE SYSTEM
GIBB GILCHRIST, Chancellor

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Preface

For many years cotton growers in the High Plains area have found that cotton harvested late in the season contained an excessive amount of foreign matter, and that the quality of the cotton was much lower than that of cotton harvested early in the season.

This bulletin gives the results of a study conducted at Lubbock and College Station to determine the amounts of different kinds of foreign matter removed in the extracting, cleaning, ginning and spinning of cotton mechanically stripped and mechanically picked at early, mid-season and late dates.

Several varieties of cotton with different fiber qualities were harvested with strippers, designated as Nos. 15 and 16 machines, and with a spindle-type picker.

At Lubbock, the stems in late-harvested cotton increased 175 percent and the dirt and sand increased 209 percent over early-harvested cotton when the No. 15 stripper was used.

Where the cotton stripper was equipped with a tractor-mounted field extractor, termed the No. 16 machine, the total foreign matter removed averaged less than half the amount removed from cotton stripped with the No. 15 machine without an extractor.

The cleaner removed an average of approximately 7 percent foreign matter from machine-stripped cotton and from machine-picked cotton that was poorly defoliated. At Lubbock, in late-harvested cotton, the dirt and sand removed by the cleaner increased 166 percent over early-harvested cotton stripped with the No. 15 machine.

Higher percentages of foreign matter were removed by the cleaner from the normal boll than from the stormproof types of cotton.

The average total foreign matter removed in extracting, cleaning and ginning of cottons machine-stripped at Lubbock at early, mid-season and late harvest dates was 28.2, 31.1 and 34.6 percent, respectively. At College Station, the total was 46.5, 42.9 and 41.1 percent, respectively, of the original sample. When the No. 16 machine was used at Lubbock, the total was 15.6, 19.2 and 17.5 percent, respectively.

At both Lubbock and College Station, the strength of 22 yarn in all but one of the varieties became weaker as the harvest was made later. The yarn from the stromproof strain, CA 89A, became stronger as the harvest was delayed.

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M34-350-3500-L180

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The Cleaning of Mechanically Harvested Cotton

H. P. SMITH, D. L. JONES and H. F. MILLER, JR.*

THE cleaning of mechanically harvested cotton is one of the most important problems confronting the cotton farmer and the ginner. More trash or foreign matter is collected with the cotton by the mechanical stripper than by the mechanical picker. The stripper removes all bolls. Insect and frost-damaged immature bolls are removed along with the well-open fully-matured bolls.

Stripped cotton, therefore, must first be separated from the burs by the extractor-cleaner equipment. It is then subjected to further cleaning before entering the gin roll box. The more completely the various kinds of trash, dirt and sand are removed the higher will be the quality of the cotton, if a good job of ginning is done.

Most machine-picked cotton should be dried to remove excess moisture before cleaning begins. As machine-picked cotton does not contain a large quantity of burs, most of the trash will usually be parts of leaves, bracts and grass stems. After drying, the cotton is passed through the cleaning equipment to the gin roll box.

The amount of different kinds of foreign matter removed in the cleaning process, for both machine-stripped and machine-picked cotton of different varieties harvested at different dates, is of considerable interest to the ginner and the farmer.

The data reported in this bulletin show the average percentages of different kinds of trash and foreign matter removed from machine-stripped and machine-picked cotton harvested at College Station and at Lubbock early in the season, at mid-season and late in the season. Varieties of cotton having different fiber characteristics were planted at each location.

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Figure. 1. The No. 15 stripper harvesting cotton at Lubbock. This machine was not equipped with a tractor-mounted field extractor.

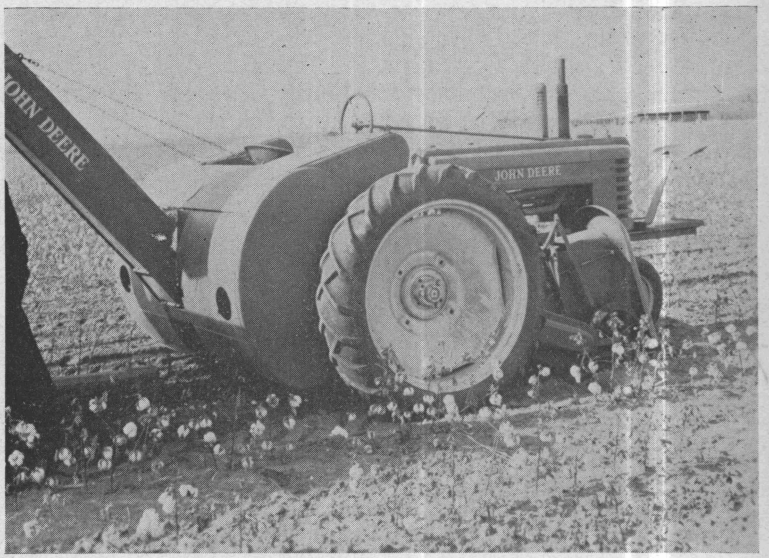

Figure 2. The No. 16 stripper was equipped with a tractor-mounted field extractor.

EQUIPMENT USED

A regular and commonly used two-row tractor-mounted commercial cotton stripper was used to harvest the samples of stripped cotton at both College Station and Lubbock. This machine was not equipped with a field extractor. It is known to the trade as the No. 15 cotton stripper (Figure 1). In one of the series of tests, the No. 15 stripper was modified and a field

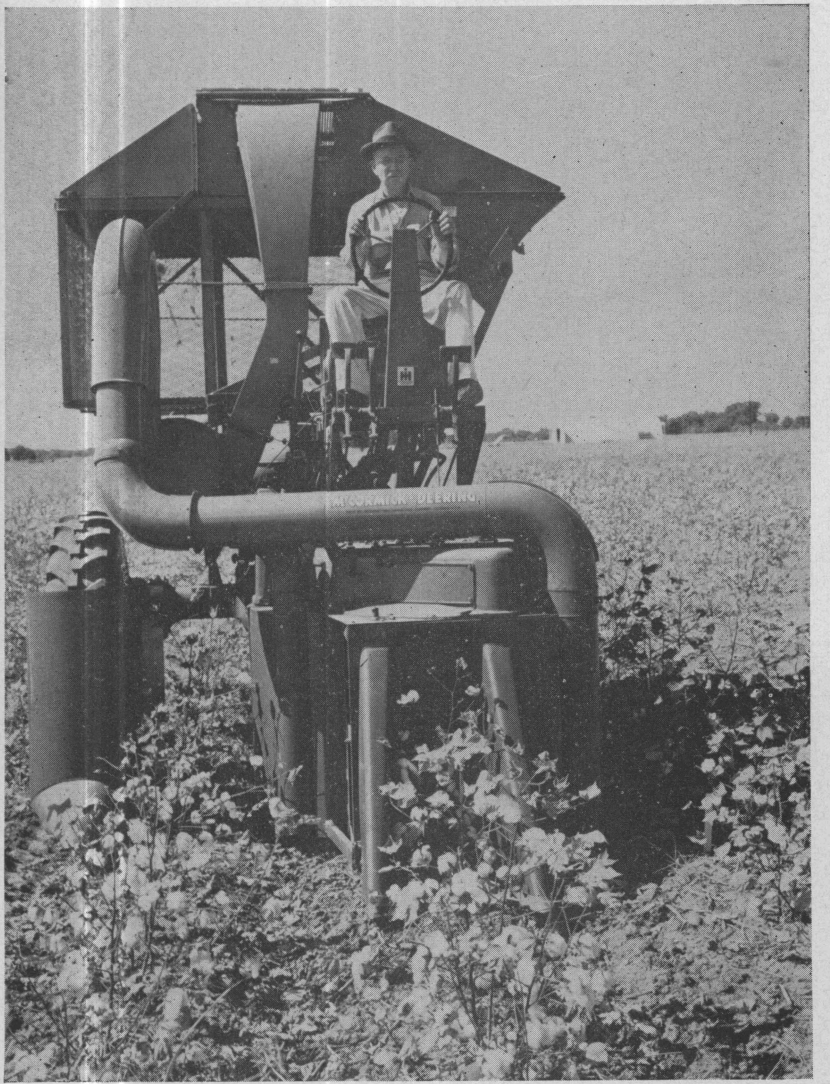

Figure 3. Cotton picking machine harvesting cotton at College Station. The plants were poorly defoliated.

Figure 4. Stationary bur extractor used in processing samples of machine-stripped cotton. Notice the burs falling out under the machine and the cotton dropping from the elevator.

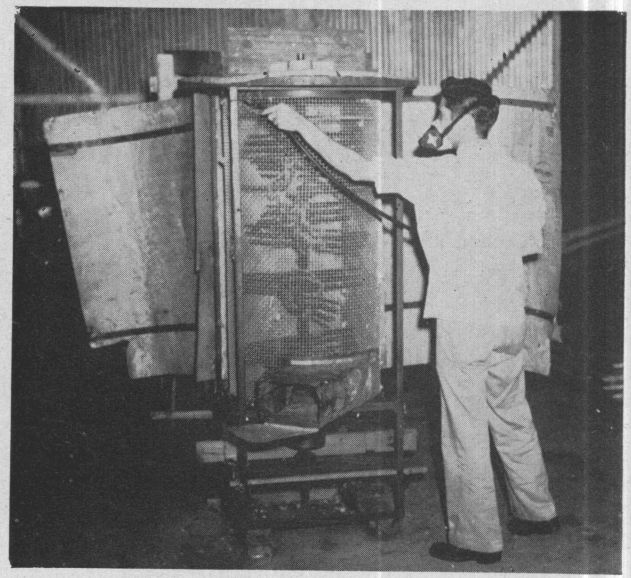

Figure 5. Cleaner used to clean samples of machine-stripped and picked cotton. The housing was opened and the remaining material removed with an air jet after processing each sample.

extractor mounted on the rear of the tractor. When the stripper was used in combination with the mounted extractor the machine was termed a No. 16 machine (Figure 2). The machine-picked samples were harvested with a commercial one-row tractor-mounted cotton picker (Figure 3).

The machine-stripped cotton at both College Station and Lubbock was extracted on the Texas Station Bur Extractor (Figure 4). This machine has been described in Texas Station Bulletin 511.

The Texas Station Vertical Cleaner, also described in Texas Station Bulletin 511, was used to clean all samples of machine-stripped cotton after the burs had been extracted (Figure 5). The machine-picked samples were cleaned on the same machine.

All the samples were ginned on a laboratory 20-saw plain-breasted gin.

METHOD OF SEPARATING THE FOREIGN MATTER

The following procedure was used in separating the foreign matter into the different classifications:

After extracting the burs from the stripped cotton, the stems, sticks and other bulky foreign matter were picked out of the remaining trash by hand (Figure 6). The remaining mass of burs, trash and dirt were screened over a ¼-inch hardware cloth screen (Figure 7). The material that remained on the

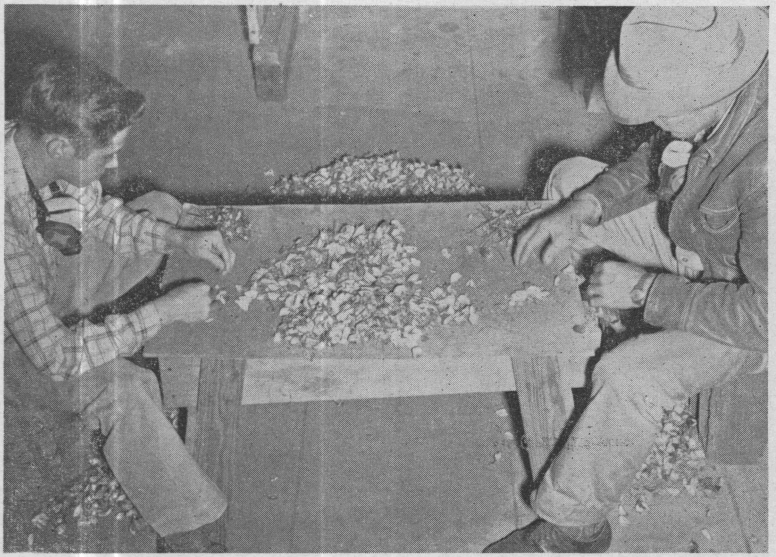

Figure 6. Separation of the stems from the burs was done by hand.

screen was classed as burs. The material passing through the ¼-inch hardware cloth was sifted over a 50-inch mesh screen (Figure 8). The material remaining on the screen was classed as fine trash and the material that passed through was classed as dirt and sand (Figure 9). The different kinds of trash were weighed and the difference between the sum of the total trash and the original sample of foreign matter was termed invisible loss.

The extracted seed cotton was passed through the cleaner. All foreign matter was carefully collected by cleaning the cleaner with a jet of air and by sweeping the floor around the cleaner.

The foreign matter collected was separated into the different classes in the same manner as the extractor trash.

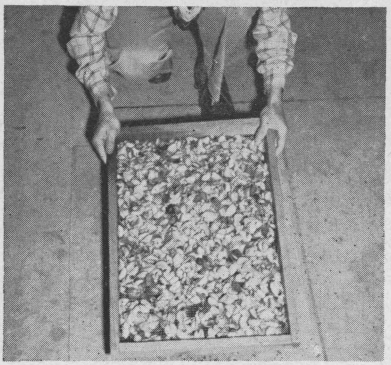

Figure 7. The fine trash, dirt and sand were separated from the burs by sifting with a ¼-inch mesh screen.

Figure 8. Dirt and sand were separated from the fine trash by sifting with a 50-mesh screen.

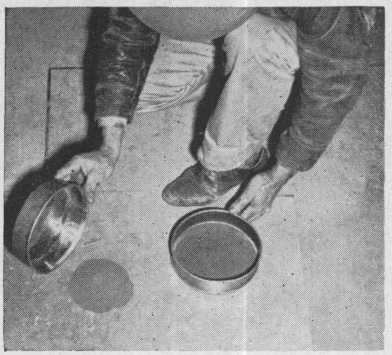

Figure 9. Dirt and sand were collected in a pan attached to the screen.

After each sample was ginned, the gin was cleaned and the dirt and trash collected from the floor. This trash was separated into two classes: motes and trash, and dirt and sand.

The waste removed by the pickers and cards in preparing the fiber for spinning was collected, weighed and the percentage calculated.

In all cases, the percentages of trash removed in each process was calculated against the weight of the sample at the beginning of that particular process. For example, the percentage of burs, stems, fine trash, dirt and sand removed by the extractor was calculated against the field harvest weight of the sample. The weight of the extracted and uncleaned seed cotton was the base for the cleaner calculations. Likewise, the weight of the cleaned seed cotton was the base for the ginning waste. The weight of the lint sample sent to the spinning laboratory was the base for calculating the percentage of picker and card waste.

VARIETIES USED

Four varieties with wide differences in fiber characteristics were selected for the study. These were Deltapine 14, Mebane 140, Stoneville 2B and CA 122; the latter is a stormproof strain developed at Lubbock. Several other varieties having suitable stripping qualities were included in the study at Lubbock.

DATES OF HARVEST

Previous studies and observations in the High Plains area around Lubbock showed that the amount of foreign matter collected by mechanical strippers increased as harvest was delayed. Therefore, the cotton in the tests was harvested at approximately monthly intervals. The first harvest was classed as early, the second as mid-season and the third as late. The actual dates of harvest, as shown in Table 1, were influenced by the maturity of the cotton and the date of the first killing freeze at Lubbock. At College Station, the early date was influenced by wet ground and the rapidity of defoliation after the application of a defoliant. Only two dates of harvest were made at Lubbock in 1946 because of a late killing freeze.

DEFOLIATION

Defoliant chemicals were applied to the cotton at College Station in late August or early September, depending on the maturity of the cotton and the ability to get into the fields with tractors. Low rainfall in 1946 caused the plants to become inactive and dust defoliants gave poor results. There was a 9-inch rain on August 26, 1947. This delayed the application

Table 1. Dates of harvest at College Station and Lubbock

Time of harvest	College Station			Lubbock		
	1946	1947	1948	1946	1947	1948
Early	Sept. 20	Sept. 23	Sept. 8	.....	Nov. 5	Oct. 10
Mid-season	Oct. 8	Oct. 20	Oct. 1	Dec. 2	Nov. 26	Nov. 11
Late	Oct. 28	Nov. 24	Nov. 1	Dec. 23	Dec. 29	Dec. 3

of defoliants. The old leaves shed from the plant after the defoliant was applied, but the heavy rainfall caused the plant to revive. New growth was so rapid that full foliage conditions were encountered when the first harvest was made. Additional applications of defoliant were not effective until the late harvest. The fall of 1948 was dry and neither dust nor spray defoliants was very effective.

At Lubbock, defoliants were applied before the first killing freeze in an effort to reduce leaf trash in the stripped cotton. Most of the leaves shed but perfect defoliation was not obtained due to drouth conditions.

FOREIGN MATTER REMOVED FROM MACHINE-STRIPPED COTTON

Foreign matter in the machine-stripped cotton was removed in four separate operations consisting of the extracting, cleaning, ginning and spinning processes. As the cotton was stripped with two types of machines, the results are discussed under the headings of the No. 15 machine at College Station and the Nos. 15 and 16 machines at Lubbock. It should be kept in mind

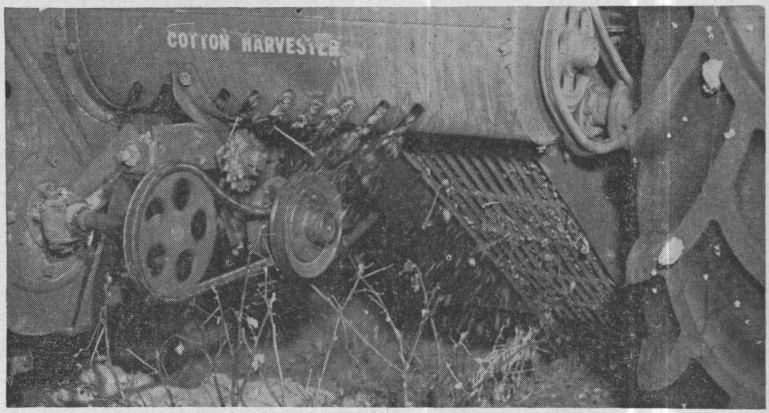

Figure 10. A grill-like bottom for the conveyor and perforations in the bottom of the cross-auger housing eliminate large amounts of fine trash, dirt and sand, and some bur sections.

Figure 11. Foreign matter, consisting of leaves and stems removed by the screen or grill on the bottom of the conveyor. A total of 7.4 pounds was removed in 425 feet of row.

that a large amount of foreign matter is separated from the seed cotton by the stripper itself as the cotton is conveyed from the stripping units to the trailer. Figure 10 shows foreign matter falling through the bottoms of the conveyer unit and also through perforations in the cross auger housing. Figure 11 shows 7.4 pounds of foreign matter collected from under the conveyer in 425 feet of row. As the cotton harvested with the No. 16 machine passed through an extractor before being conveyed to the trailer, larger quantities of foreign matter were removed in the field with this machine than with the No. 15 machine, which was not equipped with an extractor. Figure 12 shows a comparison of the trash content of cotton harvested with the two machines at Lubbock.

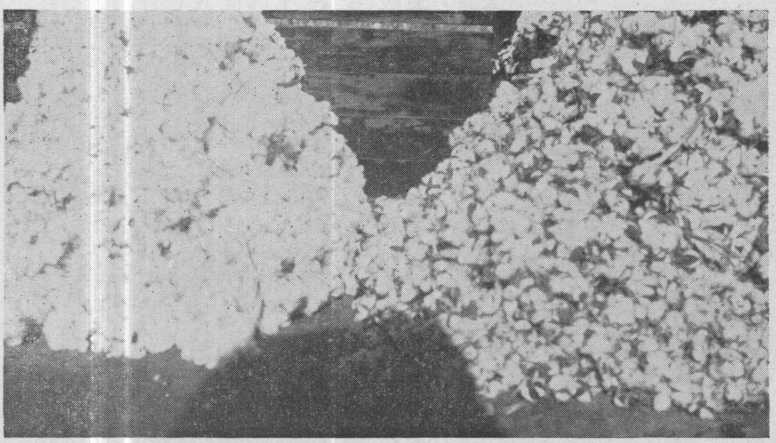

Figure 12. Left—cotton harvested by No. 16 machine which was equipped with extractor. Right—cotton harvested by the No. 15 machine.

Table 2. Average percentages of different kinds of foreign matter removed by the extractor from varieties of cotton machine-stripped with No. 15 machine at early, mid-season and late harvests at College Station, 1946-48

Variety	Seed cotton (uncleaned)	Burs	Stems	Fine trash	Dirt and sand	Invisible loss	Total percent foreign matter removed
Early harvest							
Deltapine 14	63.5	31.4	1.1	3.0	.8	.2	36.5
Stoneville 2B	63.5	29.0	.6	5.5	.8	.6	36.5
Mebane 140	62.4	29.5	1.3	5.6	.8	.4	37.6
CA 122	64.4	31.8	1.0	1.3	1.0	.5	35.6
CA 89A	49.4	27.5	2.5	19.8	.6	.2	50.6
Average	60.6	29.9	1.3	7.0	0.8	0.4	39.4
Mid-season harvest							
Deltapine 14	63.9	29.8	1.4	3.3	1.4	.2	36.1
Stoneville 2B	63.2	32.1	.6	3.0	.8	.3	36.8
Mebane 140	66.7	27.3	.9	3.9	1.1	.3	33.3
CA 122	66.8	29.0	.8	2.0	1.2	.2	33.2
CA 89A	56.7	27.9	3.0	12.0	.3	.1	43.3
Average	63.5	29.2	1.3	4.8	1.0	0.2	36.5
Percent change from early harvest	+4.8	—2.4	0.0	—45.8	+25.0	.....	—7.0
Late harvest							
Deltapine 14	64.9	30.3	1.6	1.8	1.0	.4	35.1
Stoneville 2B	62.9	33.4	.8	1.4	.8	.7	37.1
Mebane 140	65.4	29.2	1.0	2.3	1.8	.3	34.6
CA 122	64.1	30.0	1.6	2.0	1.8	.5	35.9
CA 89A	60.9	33.8	1.0	3.7	.5	.1	39.1
Average	63.6	31.3	1.2	2.3	1.2	0.4	36.4
Percent change from early harvest	+5.0	+4.7	—8.3	—204.4	+50.0	.....	—8.2
Percent change from mid-season harvest	+0.2	+7.2	—8.3	—108.7	+20.0	.....	—.3

Foreign Matter Removed by Extractor

College Station: No. 15 Machine. Early harvested stripped cotton contained more foreign matter than did cotton harvested at mid-season and late in the season (Table 2). The average total percentages of foreign matter removed from five varieties for early, mid-season and late harvests were 39.4, 36.5 and 36.4, respectively. This decrease was due primarily to better defoliation at the latter dates and, consequently, less trash was harvested with the cotton. This is reflected in the rate of decrease in the percentage of fine trash for the three harvest dates (Figure 13). The average percentages of fine trash removed were 7.0, 4.8 and 2.3, respectively, for the three dates (Table 2). As expected, there was a small increase in the amount of dirt and sand at the late harvest.

Lubbock: No. 15 Machine. Table 3 shows the percentage of the different kinds of foreign matter removed by the extractor from 11 varieties harvested early, mid-season and late. These were 21.4, 25.4 and 28.2 percent, respectively. The amount of

Table 3. **Average percentage of different kinds of foreign matter removed by the extractor from varieties of cotton machine stripped with No. 15 machine at early, mid-season and late harvests at Lubbock, 1946-48**

Variety	Seed cotton (uncleaned)	Burs	Stems	Fine trash	Dirt and sand	Invisible loss	Total percent foreign matter removed
Early harvest							
Deltapine 14	74.6	20.7	1.0	1.5	2.0	.2	25.4
Stoneville 2B	75.7	20.6	.6	1.7	1.2	.2	24.3
Mebane 140	75.4	19.2	1.0	2.2	1.8	.4	24.6
TA 122	77.9	17.6	1.1	2.6	.6	.2	22.1
TA 89A	80.8	16.0	.4	2.1	.5	.2	19.2
Northern Star	77.5	19.2	.8	1.4	1.0	.1	22.5
Paymaster	73.4	22.0	.6	2.2	1.5	.3	26.6
Bi-Bred	78.0	18.1	1.0	1.6	1.2	.1	22.0
Stormproof No. 1	81.1	16.0	.8	1.2	.6	.3	18.9
Stormmaster	85.3	11.0	.6	2.0	.9	.2	14.7
Macha Early	84.6	12.3	.6	1.4	.9	.2	15.4
Average	78.6	17.5	0.8	1.8	1.1	0.2	21.4
Mid-season harvest							
Deltapine 14	69.4	23.6	2.8	2.1	1.5	.6	30.6
Stoneville 2B	64.4	29.4	3.0	1.4	1.2	.6	35.6
Mebane 140	68.4	22.0	1.2	6.5	1.5	.4	31.6
TA 122	77.1	19.2	.9	2.0	.7	.1	22.9
TA 89A	74.7	21.0	1.5	2.5	.7	.6	25.3
Northern Star	77.3	19.2	.8	1.1	1.2	.4	22.7
Paymaster	69.7	25.1	1.0	1.8	1.9	.5	30.3
Bi-Bred	74.4	21.6	.6	1.2	1.8	.4	25.6
Stormproof No. 1	81.0	16.7	.7	.9	1.0	.7	20.0
Stormmaster	82.3	14.2	.7	1.2	1.2	.4	17.7
Macha Early	82.5	14.4	.7	1.0	1.0	.4	17.5
Average	74.6	20.6	1.3	2.0	1.2	0.5	25.4
Percent change from early harvest	−5.0	+17.7	+62.5	+11.1	+9.1	.....	+18.7
Late harvest							
Deltapine 14	66.6	23.3	3.4	2.3	3.6	.8	33.4
Stoneville 2B	60.9	30.8	2.5	1.6	3.8	.4	39.1
Mebane 140	68.4	23.5	1.8	2.6	3.3	.4	31.6
TA 122	75.7	16.8	2.3	2.3	2.4	.5	24.3
TA 89A	73.1	18.7	2.4	1.9	3.0	.9	26.9
Northern Star	70.8	21.8	1.5	1.7	3.8	.4	29.2
Paymaster	67.7	23.1	2.3	2.4	3.7	.8	32.3
Bi-Bred	67.4	24.0	1.7	1.8	4.3	.8	32.6
Stormproof No. 1	76.6	16.0	2.2	1.0	3.6	.6	23.4
Stormmaster	81.3	12.0	2.0	.8	3.3	.6	18.7
Macha Early	81.5	12.2	2.0	1.2	2.7	.4	18.5
Average	71.8	20.2	2.2	1.8	3.4	0.6	28.2
Percent change from early harvest	−9.5	+15.4	+175.0	0.0	+209.1	.....	+31.8
Percent change from mid-season harvest	−3.9	−2.0	+69.2	−11.1	+183.3	.....	+11.0

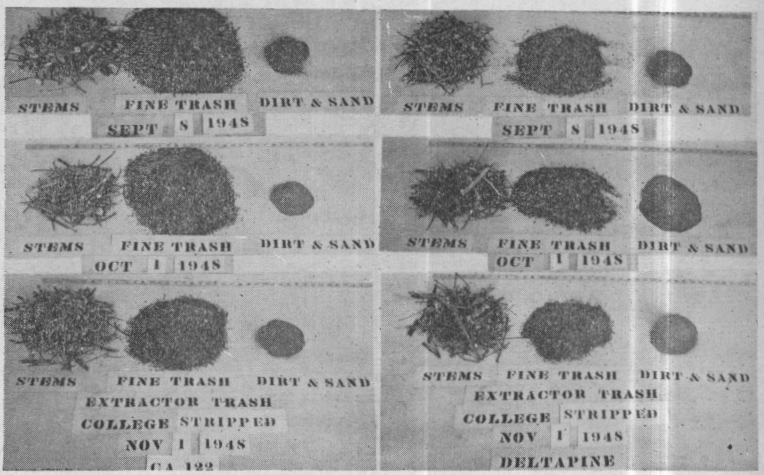

Figure 13. Comparison of the amounts of different kinds of foreign matter removed by the extractor from a stormproof and a normal boll variety. The amount of fine trash was smaller in the late harvests. The piles of dirt and sand are smaller for the stormproof (CA 122) variety than for the normal boll (Deltapine 14) variety.

foreign matter removed at mid-season increased 18.7 percent over the early harvest. The amount of foreign matter at the late harvest increased 31.8 percent over that at the early harvest. The increase in foreign matter removed at the late harvest, however, was only 11.0 percent over that at mid-season

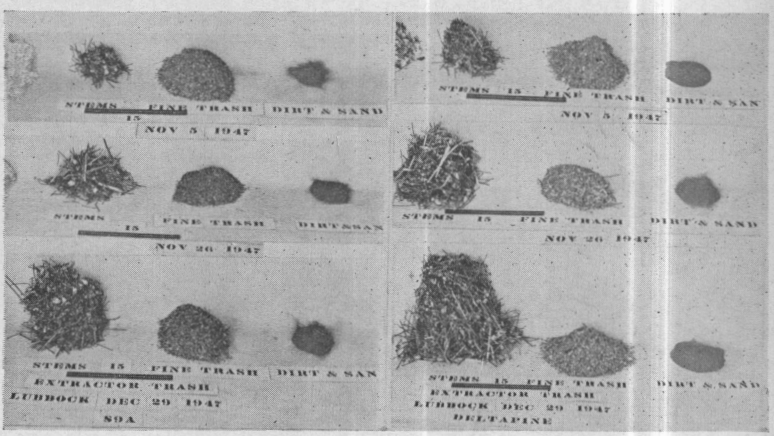

Figure 14. Comparison of amounts of different kinds of foreign matter removed by the extractor from a stormproof and a normal boll variety harvested at Lubbock. Notice the increase in the amount of stems for the late-harvested cottons.

(Table 3). The greater increase in the total amount of foreign matter removed from the early to the mid-season harvest is attributed to the plants being limber and tough at the early harvest and dry and brittle at the mid-season and late harvests. This is shown in the increase in the percentages of stems removed at the two later harvests (Figure 14). The increase in stems amounted to 175 percent (Table 3). There was also a 209 percent increase in the percentages of dirt and sand removed at the late harvest over that removed at the early harvest (Figure 14). This trend is also shown in Texas Station Progress Report 1134.

There is a noticeable difference in the percentage of foreign matter removed from different varieties. Paymaster had the highest percentage of burs and the highest total amount of foreign matter removed at the early harvest. Stoneville 2B had the largest amount of burs and total foreign matter at both the mid-season and late harvests. Stoneville 2B and Deltapine 14 had the largest amounts of stems at the mid-season and late harvests. All of the stormproof varieties, consisting of CA 122, CA 89A, Stormproof No. 1, Stormmaster and Macha Early, had relatively small amounts of burs and total foreign matter removed at all three harvests in comparison with the normal boll varieties, Deltapine 14, Stoneville 2B, Mebane 140, Northern Star, Paymaster and Hi-Bred. This is attributed to more difficult extracting qualities of the stormproof varieties. The stormproof varieties had small amounts of dirt and sand at the early harvest and averaged less at the mid-season and late harvests. This may be attributed to the difference in the fluffiness of cotton in the bolls.

Lubbock: No. 16 Machine. Where a field tractor-mounted field extractor was used in combination with the stripper, the amounts of the different kinds and the total foreign matter removed averaged less than half the amount removed from regularly stripped cotton (Tables 3 and 4). The average total percentages for all 11 varieties at the three harvests were 9.1, 13.2 and 12.3, respectively (Table 4). With the No. 15 machine, the comparable averages were 21.4, 25.4 and 28.2 percent, respectively.

Table 4 shows that the increase in stems from the early harvest to the mid-season harvest was 350 percent and the increase of the late harvest over the early harvest was 500 percent. There was, however, only a 33.3 percent increase in the percentage of stems between the late and mid-season harvests.

Tables 3 and 4 definitely show that the amounts of stems, dirt and sand, and the total trash removed, increases greatly when machine-stripping is delayed in the High Plains region until the plants have become dry and brittle and winds have blown dirt and sand into the locks of cotton.

Table 4. Average percentages of different kinds of foreign matter removed by the extractor from varieties of cotton machine-stripped with No. 16 machine at early, mid-season and late harvests at Lubbock, 1946-47

Variety	Seed cotton (uncleaned)	Burs	Stems	Fine trash	Dirt and sand	Invisible loss	Total percent foreign matter removed
Early harvest							
Deltapine 14	89.4	7.5	.3	1.1	1.6	.1	10.6
Stoneville 2B	92.0	4.8	.2	1.0	1.5	.5	8.0
Mebane 140	94.4	3.2	.3	.8	1.1	.2	5.6
CA 122	90.5	7.7	.2	1.1	.3	.2	9.5
CA 89A	91.6	6.8	.2	1.0	.2	.2	8.4
Northern Star	89.7	7.8	.2	1.2	1.0	.1	10.3
Paymaster	88.6	8.3	.3	1.2	1.3	.3	11.4
Hi-Bred	93.7	3.9	.3	.7	1.3	.1	6.3
Stormproof No. 1	89.2	9.1	.2	1.0	.3	.2	10.8
Stormmaster	92.6	6.2	.1	.5	.5	.1	7.4
Macha Early	88.5	9.6	.3	1.0	.5	.1	11.5
Average	90.9	6.8	0.2	1.0	0.9	0.2	9.1
Mid-season harvest							
Deltapine 14	82.3	12.8	2.0	1.7	1.0	.2	17.7
Stoneville 2B	86.1	9.1	.7	2.1	1.5	.5	13.9
Mebane 140	86.5	9.8	1.2	1.6	.6	.3	13.5
CA 122	85.1	11.5	1.2	1.5	.3	.4	14.9
CA 89A	84.6	12.6	1.1	1.1	.4	.2	15.4
Northern Star	88.1	9.6	.4	.5	.6	.8	11.9
Paymaster	88.7	9.3	.5	.8	.4	.3	11.3
Hi-Bred	88.0	7.7	.8	1.8	1.2	.5	12.0
Stormproof No. 1	86.7	10.7	.7	.6	.3	1.0	13.3
Stormmaster	91.2	7.2	.3	.5	.3	.5	8.8
Macha Early	87.5	10.3	.5	.5	.3	.9	12.5
Average	86.8	10.0	0.9	1.2	0.6	0.5	13.2
Percent change from early harvest	−4.7	+47.1	+350.0	+20.0	−50.0	.....	+45.0
Late harvest							
Deltapine 14	84.6	9.4	2.6	1.2	1.7	.5	15.4
Stoneville 2B	91.2	4.6	1.5	.6	1.5	.6	8.8
Mebane 140	89.8	6.3	1.4	1.2	1.1	.2	10.2
CA 122	86.8	10.5	1.0	1.0	.6	.1	13.2
CA 89A	84.8	10.7	1.4	1.6	1.0	.5	15.2
Northern Star	87.3	9.4	.8	.9	1.4	.2	12.7
Paymaster	86.1	10.9	1.1	.5	1.3	.1	13.9
Hi-Bred	88.3	7.8	1.3	.7	1.3	.6	11.7
Stormproof No. 1	88.3	9.6	.7	.6	.7	.1	11.7
Stormmaster	90.5	7.1	.4	.6	.9	.5	9.5
Macha Early	87.4	10.2	.8	.8	.6	.2	12.6
Average	87.7	8.8	1.2	0.9	1.1	0.3	12.3
Percent change from early harvest	−3.6	+29.4	+500.0	−1.1	+22.2	.....	+35.2
Percent change from mid-season harvest	+1.0	−13.6	+33.3	−33.3	+83.3	.....	−7.3

Foreign Matter Removed by Cleaner

College Station: No. 15 Machine. The samples of extracted seed cotton contained burs, stems, fine trash and dirt and sand that were not removed in the extracting process (Figure 15).

Table 5 shows the percentages of the different kinds of foreign matter removed and the total percentage removed for the three harvests at College Station. The total percentages of foreign matter removed decreased consistently from the early harvest through the mid-season to the late harvest, or 11.7, 10.5 and 7.2, respectively. This rate of decrease is comparable with the decrease of foreign matter removed in the extracting process (Table 2). The percentage of fine trash removed in cleaning decreased more than any other kind of foreign matter contained in the cotton (Figure 15). This, apparently, was due to the excessive amounts of green leaf harvested with the cotton because of poor defoliation at the earlier harvests. The average percentages of burs and stems, and dirt and sand for all five varieties did not change greatly for the three harvests at College Station. The greatest differences among varieties were in the percentage of fine trash removed. Stoneville 2B had a consistently high amount of fine trash removed in each harvest.

Table 5. Average percentages of different kinds of waste removed by the cleaner from varieties of cotton machine stripped with No. 15 machine at early, mid-season and late harvests at College Station, 1946-48

Variety	Clean seed cotton	Motes, burs and stems	Fine trash	Dirt and sand	Invisible loss	Total percent foreign matter removed
Early harvest						
Deltapine 14	88.6	4.1	6.0	.8	.5	11.4
Stoneville 2B	83.4	4.8	10.3	.6	.9	16.6
Mebane 140	90.2	3.9	4.7	.6	.6	9.8
CA 122	92.9	3.1	3.2	.6	.2	7.1
CA 89A	86.2	5.6	7.0	.3	.9	13.8
Average	88.3	4.3	6.2	0.6	0.6	11.7
Mid-season harvest						
Deltapine 14	89.3	4.5	4.7	.9	.6	10.7
Stoneville 2B	87.9	4.2	6.4	.9	.6	12.1
Mebane 140	89.7	3.5	5.3	1.0	.5	10.3
CA 122	93.3	3.2	2.6	.8	.1	6.7
CA 89A	87.3	5.0	6.9	.3	.5	12.7
Average	89.5	4.1	5.1	0.8	0.5	10.5
Percent change from early harvest	+1.4	—4.9	—21.6	+33.3	.....	—11.4
Late harvest						
Deltapine 14	91.7	4.1	3.2	.8	.2	8.3
Stoneville 2B	92.2	3.9	3.2	.6	.1	7.8
Mebane 140	93.1	3.6	2.2	.8	.3	6.9
CA 122	92.4	4.1	2.4	1.0	.1	7.6
CA 89A	94.6	2.9	2.1	.3	.1	5.4
Average	92.8	3.7	2.6	0.7	0.2	7.2
Percent change from early harvest	+5.1	—16.2	—138.5	+16.7	—200.0	—62.5
Percent change from mid-season harvest	+3.7	—10.8	—96.2	—14.3	—150.0	—45.8

Lubbock: No. 15 Machine. Table 6 shows the percentages of the different kinds of foreign matter removed by the cleaner from samples of extracted cotton for 11 varieties machine-stripped early, mid-season and late at Lubbock. The average total percentage of foreign matter removed for all varieties

Table 6. Average percentages of different kinds of foreign matter removed by the cleaner from varieties of cotton machine stripped with No. 15 machine at early, mid-season and late harvests at Lubbock, 1946-48

Variety	Clean seed cotton	Motes, burs and stems	Fine trash	Dirt and sand	Invisible loss	Total percent foreign matter removed
Early harvest						
Deltapine 14	92.0	2.4	3.9	1.4	.3	8.0
Stoneville 2B	90.0	3.2	5.5	1.0	.3	10.0
Mebane 140	92.0	2.6	3.5	1.4	.5	8.0
CA 122	93.7	2.3	3.2	.6	.2	6.3
CA 89A	94.8	2.3	2.2	.5	.2	5.2
Northern Star	91.2	4.2	3.2	1.0	.4	8.8
Paymaster	91.0	3.0	4.2	1.5	.3	9.0
Hi-Bred	93.3	2.4	3.0	1.0	.3	6.7
Stormproof No. 1	94.0	2.4	2.7	.5	.4	6.0
Stormmaster	95.4	2.2	1.6	.5	.3	4.6
Macha Early	95.1	2.2	2.0	.6	.1	4.9
Average	93.0	2.6	3.2	0.9	0.3	7.0
Mid-season harvest						
Deltapine 14	90.9	3.4	3.9	1.6	.2	9.1
Stoneville 2B	89.6	5.4	3.0	1.7	.3	10.4
Mebane 140	92.3	3.2	2.8	1.4	.3	7.7
CA 122	95.5	1.7	2.2	.5	.1	4.5
CA 89A	95.0	2.3	1.9	.6	.2	5.0
Northern Star	93.0	1.9	3.2	1.6	.3	7.0
Paymaster	91.8	2.1	3.8	1.8	.5	8.2
Hi-Bred	93.2	2.4	2.4	1.7	.3	6.8
Stormproof No. 1	94.9	2.6	1.3	.8	.4	5.1
Stormmaster	96.4	1.2	1.6	.5	.3	3.6
Macha Early	96.2	1.6	1.6	.4	.2	3.8
Average	93.5	2.5	2.5	1.2	0.3	6.5
Percent change from early harvest	+.5	—4.0	—28.0	+33.3	.....	—7.7
Late harvest						
Deltapine 14	89.3	3.5	3.6	3.1	.5	10.7
Stoneville 2B	85.8	5.4	4.8	3.4	.6	14.2
Mebane 140	91.6	3.0	2.8	2.3	.3	8.4
CA 122	94.4	2.2	1.9	1.3	.2	5.6
CA 89A	94.1	2.0	1.9	1.7	.3	5.9
Northern Star	90.7	3.7	2.2	2.8	.6	9.3
Paymaster	88.6	4.0	3.4	3.2	.8	11.4
Hi-Bred	90.0	4.0	2.7	2.9	.4	10.0
Stormproof No. 1	93.1	2.4	1.8	2.3	.4	6.9
Stormmaster	95.2	1.8	1.0	1.5	.5	4.8
Macha Early	94.8	2.4	1.3	1.3	.2	5.2
Average	91.6	3.1	2.5	2.4	0.4	8.4
Percent change form early harvest	—1.5	+19.2	—28.0	+166.7	.....	+20.0
Percent change from mid-season harvest	—2.1	+24.0	0.0	+100.0	.....	+29.2

was the lowest for the mid-season harvest. These percentages were 7.0, 6.5 and 8.4, respectively. The late-harvested cotton gave up 20 percent more foreign matter than the early harvested cotton. This, apparently, was due to the excessive amounts of foreign matter collected in harvesting at the late dates and the inability of the extractor to remove the large amounts of foreign matter present in the cotton.

The greatest increase in the kinds of foreign matter removed was in the dirt and sand. The average percentages of dirt and sand removed for all varieties for the three harvests were 0.9, 1.2 and 2.4, respectively. The percentage of dirt and sand removed at the mid-season harvest was 33.3 more than the earlier harvest. The late harvest had 166 percent more dirt and sand than the early harvest and 100 percent more than the cotton stripped in mid-season. The climate, rainfall and frequency of storms accompanied by high winds are factors in the amount of dirt and sand in the cotton at any date of harvest.

The highest percentage of total foreign matter was removed from Stoneville 2B for all three harvests. The amount of foreign matter removed by the cleaner increased with later harvestings, and was 10.0, 10.4 and 14.2 percent, respectively. There was more fine trash removed than any other kind of foreign matter.

The lowest percentage of total foreign matter removed by the cleaner for all three harvests was from Stormmaster, and was 4.6, 3.6 and 4.8, respectively. More burs and stems were removed at the early and late harvests than any other kind of foreign matter. A slightly higher percentage of fine trash than of burs and stems was removed at the mid-season harvest.

Table 6 shows that, as a general rule, the normal boll types of cotton gave up more foreign matter in cleaning than the stormproof types (Figure 16). This was apparently because more burs were left in the seed cotton of the stormproof cottons by the extractor than in the normal boll types. On the other hand, more fine trash was left in the seed cotton of the normal boll types than in the stormproof types. It is obvious that small particles of fine leaf trash can be removed by cleaning equipment from seed cotton more easily than large particles of burs.

Tables 2, 3, 5 and 6 show that more foreign matter was collected at College Station in machine stripping, where green foliage was on the plants from poor defoliation, than from cottons harvested at Lubbock after a killing freeze.

Lubbock: No. 16 Machine. Table 7 shows the percentages of different kinds of foreign matter removed by the cleaner from cotton that had been partially extracted by a tractor-mounted field extractor and finished by a stationary laboratory

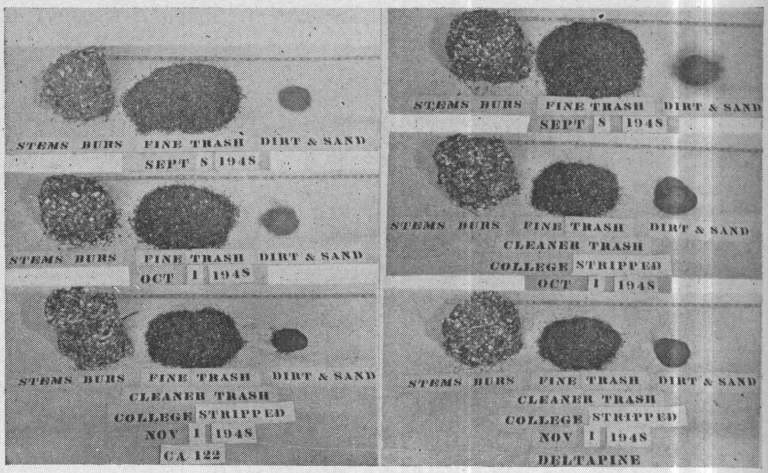

Figure 15. Comparison of the amounts of different kinds of foreign matter removed by the cleaner from cotton stripped early, mid-season and late at College Station. The piles of fine trash become smaller with later harvesting.

extractor. Only 0.7 percent less total foreign matter was removed by the cleaner from cotton harvested by the No. 16 machine at the early and mid-season harvests (Table 7), than was removed from the cotton harvested by the No. 15 machine (Table 6). The No. 15 machine, at the late harvest, removed 3.4 percent more total foreign matter than the No. 16 machine. This seems to indicate that the No. 16 machine removed considerable amounts of foreign matter at the late harvest.

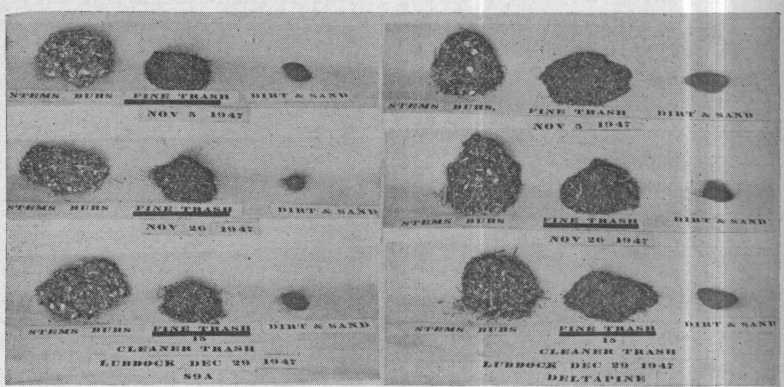

Figure 16. Comparison of the amounts of foreign matter removed by the cleaner from a stormproof and a normal boll variety stripped at College Station.

Table 7. Average percentages of different kinds of foreign matter removed by the cleaner from varieties of cotton machine stripped with No. 16 machine at early, mid-season and late harvests at Lubbock, 1946-47

Variety	Clean seed cotton	Motes, burs and stems	Fine trash	Dirt and sand	Invisible loss	Total percent foreign matter removed
Early harvest						
Deltapine 14	92.5	2.5	2.6	2.0	.4	7.5
Stoneville 2B	93.3	2.1	2.9	1.5	.2	6.7
Mebane 140	93.9	2.3	2.2	1.2	.4	6.1
CA 122	94.9	2.5	1.4	1.1	.1	5.1
CA 89A	95.2	2.7	1.6	.2	.3	4.8
Northern Star	89.9	5.3	2.9	1.2	.7	10.1
Paymaster	91.5	3.0	3.6	1.2	.7	8.5
Hi-Bred	94.6	1.7	1.5	1.7	.5	5.4
Stormproof No. 1	94.5	3.1	1.7	.6	.1	5.5
Stormmaster	95.7	2.5	1.1	.5	.2	4.3
Macha Early	94.8	2.2	2.2	.3	.5	5.2
Average	93.7	2.7	2.2	1.0	0.4	6.3
Mid-season harvest						
Deltapine 14	92.8	2.3	4.0	.7	.2	7.2
Stoneville 2B	91.1	4.7	2.9	.7	.6	8.9
Mebane 140	92.4	3.2	3.2	.8	.4	7.6
CA 122	93.6	2.2	3.2	.6	.4	6.4
CA 89A	94.0	2.4	2.9	.5	.2	6.0
Northern Star	94.4	1.9	2.7	.8	.7	5.6
Paymaster	94.9	2.0	1.8	1.0	.3	5.1
Hi-Bred	94.5	2.7	1.8	.7	.3	5.5
Stormproof No. 1	95.8	.2	3.0	.4	.6	4.2
Stormmaster	96.6	1.6	1.1	.3	.4	3.4
Macha Early	96.0	2.1	1.2	.3	.4	4.0
Average	94.2	2.3	2.5	0.6	0.4	5.8
Percent change from early harvest...	+.5	—17.4	+13.6	—66.7	.....	—8.6
Late harvest						
Deltapine 14	93.0	2.6	2.6	1.4	.4	7.0
Stoneville 2B	90.6	4.7	2.4	1.5	.6	9.2
Mebane 140	94.0	2.4	2.2	1.0	.4	6.0
CA 122	95.2	2.3	1.8	.3	.4	4.8
CA 89A	94.8	2.4	2.2	.5	.1	5.2
Northern Star	97.6	1.6	.4	.1	.3	2.4
Paymaster	97.8	1.3	.4	.2	.3	2.2
Hi-Bred	94.8	2.3	1.7	.9	.3	5.2
Stormproof No. 1	95.6	2.4	.9	.6	.5	4.4
Stormmaster	95.7	2.0	.8	.8	.7	4.3
Macha Early	95.5	2.5	.9	.5	.6	4.5
Average	95.0	2.4	1.5	0.7	0.4	5.0
Percent change from early harvest...	+1.4	—12.5	—46.7	—42.9	.....	—26.0
Percent change from mid-season harvest	+0.9	—4.3	—66.7	+16.7	.....	—16.0

Foreign Matter Removed by Ginning

College Station: No. 15 Machine. Table 8 shows that the average percentage of the different kinds of foreign matter removed from the five varieties stripped at College Station was only 1.4 for both early and mid-season harvests. There was,

however, a 14.3 percent decrease in fine trash for the late harvest. This is in line with the decreased amounts of fine trash removed from the samples in the extracting and cleaning processes.

Lubbock: No. 15 Machine. The average percentages of different kinds of foreign matter removed by ginning from 11 varieties of cotton stripped with the No. 15 machine early, mid-season and late at Lubbock are shown in Table 9. There was no difference in the average amounts of fine trash removed by ginning for all three harvests. Only 0.06 percent less dirt and sand was removed at the mid-season than for the early and late harvests.

The percentages of dirt and sand removed by ginning from the samples of the 11 varieties for all three harvests averaged

Table 8. Average percentages of different kinds of foreign matter removed in ginning, the percentages of seed and lint, the grade and staple of cotton machine-stripped with No. 15 machine at early, mid-season and late harvests at College Station, 1946-48

Variety	Fine trash	Dirt and sand	Invisible loss	Total trash loss	Seed	Lint	Grade*	Staple
Early harvest								
Deltapine 14	.7	.2	.5	1.4	61.7	36.9	7.8	31
Stoneville 2B	.8	.2	.2	1.2	64.8	34.0	8.5	32
Mebane 140	.8	.3	.4	1.5	60.1	38.4	6.8	28
CA 122	.8	.3	.5	1.6	61.4	37.0	7.0	31
CA 89A	.7	.1	.2	1.0	61.6	37.4	9.0	29
Average	0.8	0.2	0.4	1.4	61.9	36.7	7.8	30.2
Mid-season harvest								
Deltapine 14	.8	.2	.6	1.6	61.3	37.1	8.0	30
Stoneville 2B	1.0	.1	.5	1.6	65.8	32.6	8.5	32
Mebane 140	.7	.2	.5	1.4	60.0	38.6	8.2	27
CA 122	.8	.2	.3	1.3	61.5	37.2	7.5	30
CA 89A	.7	.1	.2	1.0	65.6	33.4	9.0	29
Average	0.8	0.2	0.4	1.4	62.8	35.8	8.2	29.6
Percent change from early harvest	0.0	0.0	0.0	0.0	+1.4	−2.5	.....	.....
Late harvest								
Deltapine 14	.7	.2	.3	1.2	61.5	37.3	8.0	30
Stoneville 2B	.6	.2	.2	1.0	65.3	33.7	8.5	30
Mebane 140	.9	.3	.2	1.4	58.8	39.8	8.2	27
CA 122	1.0	.2	.5	1.7	59.6	38.7	7.5	29
CA 89A	.5	.1	.1	.7	64.5	34.8	9.0	30
Average	0.7	0.2	0.3	1.2	61.9	36.9	8.2	29.2
Percent change from early harvest	−14.3	0.0	−33.3	−16.7	0.0	+0.5	.....	.....
Percent change from mid-season harvest	−14.3	0.0	−33.3	−16.7	−1.4	+3.1	.....	.....

*5 = M 6 = SLM 7 = LM 8 = SGO 9 = GO 10 = BG

0.2 for the early and late harvest and 0.06 for the mid-season harvest. The percentages of fine trash ranged from 0.4 to 0.9 for the different varieties at the early harvest and from 0.4 to 0.8 at the mid-season and late harvests. Slightly higher percentages of fine trash were removed from the stormproof types, *CA 122, CA 89A, Stormproof No. 1, Stormmaster* and *Macha*

Table 9. Average percentages of different kinds of foreign matter removed in ginning, the percentages of seed and lint and the grade and staple of cotton machine-stripped with No. 15 machine at early, mid-season and late harvests at Lubbock, 1946-48

Variety	Fine trash	Dirt and sand	Invisible loss	Total trash loss	Seed	Lint	Grade	Staple
Early harvest								
Deltapine 14	.4	.2	.5	1.1	59.5	39.4	7.5	29
Stoneville 2B	.8	.2	.5	1.5	63.2	35.3	9.0	31
Plebane 140	.5	.2	.5	1.2	59.6	39.2	8.0	28
CA 122	.7	.2	.2	1.1	61.9	37.0	7.0	30
CA 89A	.8	.1	.2	1.1	61.5	37.4	7.0	30
Northern Star	.4	.2	.4	1.0	61.0	38.0	8.0	29
Paymaster	.7	.2	.4	1.3	60.6	38.1	7.5	28
Hi-Bred	.4	.2	.5	1.1	56.5	42.4	6.5	26
Stormproof No. 1	.6	.2	.5	1.3	59.6	39.1	8.0	26
Stormmaster	.9	.2	.6	1.7	61.0	37.3	8.0	30
Macha Early	.7	.2	.6	1.5	63.1	35.4	7.5	29
Average	0.6	0.2	0.4	1.2	60.7	38.1	7.6	28.7
Mid-season harvest								
Deltapine 14	.5	.2	.2	.9	59.1	40.0	10.0	32
Stoneville 2B	.5	.2	.2	.9	61.0	38.1	10.0	30
Plebane 140	.5	.1	.4	1.0	59.7	39.3	9.0	26
CA 122	.7	.1	.6	1.4	60.6	38.0	8.0	29
CA 89A	.6	.1	.4	1.1	60.7	38.2	10.0	30
Northern Star	.4	.2	.8	1.4	60.5	38.1	10.0	30
Paymaster	.5	.1	.4	1.0	59.6	39.4	10.0	28
Hi-Bred	.4	.1	.6	1.1	57.2	41.7	9.0	26
Stormproof No. 1	.6	.2	.5	1.3	59.9	38.8	9.0	28
Stormmaster	.8	.2	.5	1.5	60.7	37.8	10.0	28
Macha Early	.8	.1	.5	1.4	62.3	36.3	9.0	29
Average	0.6	0.14	0.5	1.2	60.1	38.7	9.3	29.0
Percent change from early harvest	0.0	—42.8	.....	0.0	—1.0	+1.6	.....	.....
Late harvest								
Deltapine 14	.6	.2	.2	1.0	59.8	39.2	9.0	29
Stoneville 2B	.8	.2	.2	1.2	62.8	36.0	10.0	31
Plebane 140	.4	.2	.4	1.0	61.0	38.0	8.0	26
CA 122	.6	.1	.6	1.3	61.5	37.2	7.5	30
CA 89A	.6	.2	.4	1.2	61.6	37.2	10.0	30
Northern Star	.5	.2	.5	1.2	61.3	37.5	8.0	30
Paymaster	.6	.2	.1	.9	60.8	38.3	10.0	28
Hi-Bred	.4	.2	.7	1.3	57.3	41.4	8.0	26
Stormproof No. 1	.4	.2	.6	1.2	60.9	37.9	8.0	29
Stormmaster	.8	.2	.4	1.4	61.6	37.0	9.0	28
Macha Early	.8	.2	.7	1.7	63.7	34.6	8.0	30
Average	0.6	0.2	0.4	1.2	61.1	37.7	8.6	28.9
Percent change from early harvest	0.0	0.0	.....	0.0	+0.7	—1.1	.....	.....
Percent change from mid-season harvest	0.0	+42.8	.....	0.0	+1.7	—2.6	.....	.....

Early than from the normal boll types, Deltapine 14, Stoneville 2B, Mebane 140, Northern Star, Paymaster and Hi-Bred. The short staple Hi-Bred and Mebane 140 varieties were consistently low for all three harvest dates.

The variation in the percentages of fine trash removed by ginning may be attributed to the degree of cleanliness of the

Table 10. Average percentages of different kinds of foreign matter removed in ginning, the percentages of seed and lint and the grade and staple of cotton machine-stripped with No. 16 machine at early, mid-season and late harvests at Lubbock, 1946-47

Variety	Fine trash	Dirt and sand	Invisible loss	Total trash loss	Seed	Lint	Grade	Staple
Early harvest								
Deltapine 14	.3	.1	.3	.7	59.9	39.4	7.0	30
Stoneville 2B	.2	.1	.5	.8	61.2	38.0	6.0	30
Mebane 140	.2	.1	.1	.4	59.3	40.3	5.0	26
CA 122	.5	.1	.6	1.2	61.5	37.3	7.0	30
CA 89A	.5	.1	.4	1.0	63.5	35.5	6.0	30
Northern Star	.5	.1	.2	.8	60.5	38.7	5.5	30
Paymaster	.4	.1	.5	1.0	59.6	39.4	5.5	30
Hi-Bred	.3	.1	.9	1.3	57.6	41.1	5.0	29
Stormproof No. 1	.5	.1	.6	1.2	59.2	39.6	6.0	28
Stormmaster	.6	.1	.8	1.5	61.6	36.9	6.0	30
Macha Early	.7	.1	.3	1.1	63.2	35.7	5.5	29
Average	0.4	0.1	0.5	1.0	60.6	38.4	5.9	29.3
Mid-season harvest								
Deltapine 14	.4	.2	.6	1.2	58.8	40.0	8.5	30
Stoneville 2B	.4	.1	.9	1.4	60.3	38.3	10.0	28
Mebane 140	.3	.1	.7	1.1	58.7	40.2	7.0	27
CA 122	1.0	.2	.5	1.7	60.2	38.1	6.0	29
CA 89A	.5	.2	.3	.8	60.3	38.8	7.5	29
Northern Star	.5	.1	1.0	1.6	60.4	38.0	7.0	31
Paymaster	.5	.2	.9	1.6	59.0	39.4	7.0	29
Hi-Bred	.3	.1	1.0	1.4	55.1	43.5	7.0	26
Stormproof No. 1	.6	.1	.8	1.5	59.0	39.5	6.0	28
Stormmaster	.6	.1	.7	1.4	61.3	37.3	6.5	30
Macha Early	.7	.1	1.1	1.9	63.0	35.1	6.0	29
Average	0.5	0.1	0.8	1.4	59.7	38.9	7.2	29
Percent change from early harvest	+25.0	0.0	+60.0	+40.0	−1.5	+1.3	.....	.....
Late harvest								
Deltapine 14	.4	.2	.4	1.0	59.5	39.5	9.0	31
Stoneville 2B	.4	.1	.3	.8	61.4	37.8	10.0	30
Mebane 140	.4	.1	.2	.7	59.2	40.1	8.0	27
CA 122	.6	.2	.4	1.2	60.8	38.0	6.5	30
CA 89A	.5	.1	.4	1.0	61.0	38.0	7.5	29
Northern Star	.4	.1	.1	.6	61.4	38.0	8.0	29
Paymaster	.4	.1	.1	.6	61.0	38.4	8.0	30
Hi-Bred	.3	.1	.5	.9	57.0	42.1	8.0	26
Stormproof No. 1	.6	.1	.6	1.3	59.9	38.8	7.0	28
Stormmaster	.8	.1	.8	1.7	62.7	35.6	6.0	29
Macha Early	.7	.1	.8	1.6	64.2	34.2	7.0	29
Average	0.5	0.1	0.4	1.0	60.8	38.2	7.7	28.9
Percent change from early harvest	+25.0	0.0	−25.0	0.0	+0.3	−0.5	.....	.....
Percent change from mid-season harvest	0.0	0.0	−100.0	0.0	+1.8	−1.8	.....	.....

seed cotton. Hi-Bred and Mebane 140 have good cleaning qualities while the stormproof varieties contain large amounts of burs because of their poor extracting qualities. The 20-saw laboratory gin had only one set of ribs, a plain-breasted gin, while the standard size gin is equipped with two sets of ribs and is called a double-breasted gin. It also has huller rolls to take out most of the burs. A double-breasted huller gin would remove higher percentages of burs and fine trash than the laboratory gin used in these studies.

Lubbock: No. 16 Machine. Table 10 shows the percentages of foreign matter removed in ginning from cotton stripped with the No. 16 machine. The differences in the amounts of foreign matter removed from the 11 varieties harvested early, mid-season and late are similar to those obtained for the No. 15 machine. Higher percentages of foreign matter were removed from the stormproof types than from the normal boll types.

Total Pounds of Foreign Matter Removed in Extracting, Cleaning and Ginning

The foregoing data have shown the percentage of foreign matter removed from the sample weight at the beginning of each processing step. Tables 11, 12 and 13 show the average weights of the original sample, and the actual total weights of the foreign matter removed in extracting, cleaning and ginning of the machine-stripped cotton at College Station and Lubbock for the three harvests.

The foreign matter removed in the spinning tests for lint samples of machine-stripped cotton could not be added to that removed in extracting, cleaning and ginning because all of the lint was not used in the spinning tests.

College Station: No. 15 Machine. The average weights of the samples of stripped cotton at the early, mid-season and late harvests were 56.5, 58.5 and 54.3 pounds, respectively (Table 11). The average foreign matter removed by the extractor was 22.1, 21.1 and 19.7 pounds, respectively. The average weights of the foreign matter removed by the cleaner were 3.6, 3.3 and 2.3 pounds, respectively, while the amounts removed in ginning were 0.3, 0.4 and 0.3 pound, respectively. The average total foreign matter removed was 26.0, 24.8 and 22.3 pounds, respectively, for the five varieties stripped at early, mid-season and late harvests. The percentages of the total foreign matter removed of the original sample were 46.5, 42.9 and 41.1, respectively.

The amount and percentage of foreign matter decreased for the later harvests because better defoliation was obtained.

It is of interest to note that, at College Station, from 41.1 to 46.5 percent of the material harvested was removed as foreign matter in the extracting, cleaning and ginning processes.

Lubbock: No. 15 Machine. Table 12 shows that the average sizes of the sample of machine-stripped cotton for the three harvests were 37.5, 40.0 and 39.5 pounds, respectively, for the No. 15 machine. The total average weights of foreign matter removed by extracting, cleaning and ginning were 10.6, 12.2 and 13.5 pounds, respectively. The average percentages of the total foreign matter removed of the original sample were 28.2, 31.1 and 34.6 pounds, respectively. It is noted here, as above, that at late harvest there was an increase in the amount and percentage of foreign matter removed.

Table 11. Average weight of original sample and waste removed by extractor, cleaner and gin from machine stripped cotton at College Station with No. 15 machine, 1946-47

Variety	Original sample (lbs.)	Foreign matter removed by			Total foreign matter removed (lbs.)	Percent of original sample
		Extractor (lbs.)	Cleaner (lbs.)	Gin (lbs.)		
Early harvest						
Deltapine 14	62.2	22.7	3.6	.4	26.7	42.9
Stoneville 2B	50.0	18.0	5.5	.3	23.8	47.6
Mebane 140	55.9	20.8	2.8	.4	24.0	42.9
CA 122	64.2	23.5	2.4	.4	26.3	41.0
CA 89A	50.0	25.3	3.5	.2	29.0	58.0
Average	56.5	22.1	3.6	0.3	26.0	46.5
Mid-season harvest						
Deltapine 14	63.8	22.6	3.3	.5	26.4	41.4
Stoneville 2B	50.0	18.4	4.0	.4	22.8	45.6
Mebane 140	62.7	20.2	3.3	.3	23.8	38.0
CA 122	66.2	22.8	2.2	.4	25.4	38.4
CA 89A	50.0	21.7	3.7	.3	25.7	51.4
Average	58.5	21.1	3.3	0.4	24.8	42.9
Percent change from early harvest	+3.5	—4.7	—9.1	+3.3	—4.8	—8.4
Late harvest						
Deltapine 14	73.3	25.8	2.7	.3	28.8	39.3
Stoneville 2B	50.0	18.2	2.5	.4	21.1	42.2
Mebane 140	44.8	15.6	1.9	.4	17.9	40.0
CA 122	53.6	19.4	2.4	.4	22.2	41.4
CA 89A	50.0	19.5	1.7	.2	21.4	42.8
Average	54.3	19.7	2.3	0.3	22.3	41.1
Percent change from early harvest	—4.0	—12.2	—56.5	0.0	—16.6	—13.1
Percent change from mid-season harvest	—7.7	—7.1	—43.5	—33.3	—11.2	—4.4

As explained above, this is attributed to the cotton plants being limber and tough at the early harvest and dry and brittle at the two later harvests. Table 12 shows that most of the foreign matter was removed in the extracting process.

Table 12. Average weight of original sample and foreign matter removed by the extractor, cleaner and gin from cotton machine-stripped at Lubbock with No. 15 machine, 1946-48.

Variety	Original sample (lbs.)	Foreign matter removed by			Total foreign matter removed (lbs.)	Percent of original sample
		Extractor (lbs.)	Cleaner (lbs.)	Gin (lbs.)		
Early harvest						
Deltapine 14	37.4	9.6	2.2	.3	12.1	32.4
Stoneville 2B	39.7	9.7	3.0	.4	13.1	33.0
Mebane 140	37.2	9.1	2.3	.3	11.7	31.4
CA 122	34.7	7.7	1.7	.2	9.6	27.7
CA 89A	36.8	7.0	1.5	.3	8.8	23.9
Northern Star	38.8	8.8	2.7	.3	11.8	30.4
Paymaster	36.4	9.7	2.4	.4	12.5	34.3
Hi-Bred	39.0	8.6	2.0	.3	10.9	28.0
Stormproff No. 1	36.9	7.0	1.8	.4	9.2	24.9
Stormmaster	40.2	5.8	1.6	.6	8.9	19.9
Macha Early	35.8	6.4	1.6	.5	8.5	23.7
Average	37.5	8.1	2.1	0.4	10.6	28.2
Mid-season harvest						
Deltapine 14	41.6	12.3	2.7	.4	15.4	37.0
Stoneville 2B	32.7	11.5	2.4	.2	14.1	43.1
Mebane 140	37.8	12.4	2.0	.3	14.7	38.9
CA 122	44.4	10.1	1.5	.4	12.0	27.0
CA 89A	43.1	10.9	1.5	.3	12.7	29.5
Northern Star	38.5	8.7	2.2	.4	11.3	29.4
Paymaster	35.6	10.8	2.0	.2	13.0	36.5
Hi-Bred	34.6	8.8	1.9	.3	11.0	31.8
Stormproof No. 1	44.3	9.0	1.8	.4	11.2	25.3
Stormmaster	41.8	7.5	1.2	.5	9.2	22.0
Macha Early	45.4	8.0	1.4	.5	9.9	21.8
Average	40.0	10.0	1.9	0.3	12.2	31.1
Percent change from early harvest	.....	+23.5	—10.5	—33.3	+15.1	+10.3
Late harvest						
Deltapine 14	40.9	13.9	2.8	.2	16.9	41.3
Stoneville 2B	32.8	12.8	2.8	.2	15.8	48.2
Mebane 140	41.8	13.2	2.2	.2	15.6	37.3
CA 122	43.7	10.8	1.7	.4	12.9	29.5
CA 89A	43.7	11.9	1.8	.3	14.0	32.0
Northern Star	40.5	11.9	2.6	.2	14.7	36.3
Paymaster	34.2	10.5	2.6	.2	13.3	38.9
Hi-Bred	34.6	11.4	2.4	.2	14.0	40.5
Stormproof No. 1	37.8	8.9	2.0	.4	11.3	29.9
Stormmaster	44.2	8.2	1.7	.4	10.3	23.3
Macha Early	40.4	7.5	1.8	.4	9.7	24.0
Average	39.5	11.0	2.2	.3	13.5	34.6
Percent change from early harvest	.....	+35.8	+4.8	—33.3	+27.4	+22.7
Percent change from mid-season harvest	.....	+10.0	+15.8	0.0	+10.7	+11.2

Lubbock: No. 16 Machine. Tables 12 and 13 show that the average weight of the sample from the No. 16 machine ranged from 5.1 to 9.5 pounds less than from the No. 15 machine. Consequently, comparisons are made on the percentage of the total foreign matter removed from the original samples. The

Table 13. Average weight of original sample and foreign matter removed by extractor, cleaner and gin from machine-stripped cotton at Lubbock with No. 16 machine, 1946-47

Variety	Original sample (lbs.)	Foreign matter removed by			Total foreign matter removed (lbs.)	Percent of original sample
		Extractor (lbs.)	Cleaner (lbs.)	Gin (lbs.)		
Early harvest						
Deltapine 14	30.5	3.3	2.1	.2	5.5	18.0
Stoneville 2B	30.2	2.4	1.9	.2	4.5	14.9
Mebane 140	30.1	1.6	1.8	.1	3.5	11.7
CA 122	30.0	2.8	1.4	.3	4.5	15.0
CA 89A	30.0	2.5	1.3	.3	4.1	13.8
Northern Star	30.2	3.1	2.8	.2	6.1	20.1
Paymaster	30.5	3.4	2.3	.2	6.0	19.7
Hi-Bred	30.4	1.9	1.5	.3	3.7	12.2
Stormproof No. 1	30.4	3.3	1.5	.3	5.1	16.7
Stormmaster	31.1	2.3	1.2	.4	3.9	12.7
Macha Early	30.6	3.5	1.4	.2	5.2	16.8
Average	30.4	2.7	1.8	0.2	4.7	15.6
Mid-season harvest						
Deltapine 14	35.8	6.4	2.1	.3	8.8	24.6
Stoneville 2B	30.0	4.2	2.2	.3	6.7	22.4
Mebane 140	33.5	4.5	2.2	.2	6.9	20.6
CA 122	33.5	4.8	1.8	.4	7.0	20.9
CA 89A	42.8	6.8	1.9	.2	8.9	20.8
Northern Star	33.2	4.0	1.6	.4	6.0	18.2
Paymaster	32.0	3.6	1.4	.4	5.5	17.0
Hi-Bred	32.6	3.9	1.6	.4	5.9	18.0
Stormproof No. 1	35.6	4.8	1.3	.4	6.5	18.2
Stormmaster	39.2	3.5	1.2	.5	5.1	13.1
Macha Early	36.2	4.5	1.3	.6	6.4	17.6
Average	34.9	4.6	1.7	0.4	6.7	19.2
Percent change from early harvest	.....	+70.4	—5.9	+100.0	+42.6	+23.1
Late harvest						
Deltapine 14	31.2	4.8	1.9	.2	6.9	22.1
Stoneville 2B	16.9	1.5	1.5	.1	3.1	18.1
Mebane 140	32.0	3.3	1.7	.2	5.2	16.2
CA 122	33.0	4.5	1.4	.2	6.1	18.5
CA 89A	32.9	5.0	1.4	.3	6.7	20.4
Northern Star	32.9	4.2	.6	.2	5.0	15.2
Paymaster	28.3	4.0	.5	.1	4.6	16.3
Hi-Bred	30.0	3.5	1.4	.2	5.1	17.0
Stormproof No. 1	31.0	3.6	1.2	.3	5.2	16.6
Stormmaster	30.2	2.9	1.2	.4	4.5	14.8
Macha Early	32.1	4.0	1.3	.4	5.7	17.8
Average	30.0	4.0	1.3	0.2	5.3	17.5
Percent change from early harvest	.....	+48.2	—38.5	0.0	+12.8	+12.2
Percent change from mid-season harvest	.....	—15.0	—30.8	—100.0	—26.4	—9.7

average percentages of foreign matter removed by the No. 16 machine for the three harvests were 15.6, 19.2 and 17.5, respectively. Smaller amounts of foreign matter were removed from the No. 16 machine stripped and extracted cotton than from the No. 15 stripped cotton not extracted in the field. The differences in the average percentages of foreign matter for the No. 15 and 16 machines for the three harvests were 12.6, 11.9 and 17.1, respectively.

The rate of increase in the total foreign matter removed was greater between the mid-season and early harvests than between the mid-season and late harvests. The general trend in increased amounts of foreign matter removed for the late harvest is similar for both the No. 15 and 16 machines.

Foreign Matter Removed in Spinning Tests

College Station: No. 15 Machine. The first column in Table 14 shows the percentage of foreign matter removed from lint samples of five varieties of machine-stripped cotton at College Station. There was no apparent significant difference in the average foreign matter removed from them for the three harvests, as the percentages were 20.4, 21.9 and 21.6, respectively.

The percentages of foreign matter removed from the different varieties harvested at early, mid-season and late were not consistent. The highest percentage of foreign matter, 23.8, was removed from Stoneville 2B at the early harvest. The highest percentages of foreign matter removed from any variety for the mid-season and late harvests were 23.8 and 24.0, respectively, from CA 122, a stormproof variety. The foreign matter removed from lint samples of Mebane 140 averaged the lowest for all three harvests. This variety has good cleaning qualities as it gives up foreign matter readily.

Tables 14 and 15 show that considerably higher percentages of foreign matter were removed by the picker and cards in the spinning tests from cotton machine-stripped at College Station than at Lubbock. Tables 2, 3, 5, 6, 11 and 12 show that larger amounts of foreign matter were removed by the extractor and cleaner from cottons stripped with the No. 15 machine at College Station than at Lubbock.

Lubbock: No. 15 Machine. The first column of Table 15 shows the percentages of foreign matter removed by the picker and cards in spinning tests of lint samples from 11 varieties of machine-stripped cotton at Lubbock at early, mid-season and late harvests. The average percentages of foreign matter removed from all varieties at the three harvests were 16.9, 18.9 and 17.2, respectively. Higher percentages were removed from cottons harvested at mid-season than at the early and late harvests. Table 6 shows that lower percentages of foreign matter

were removed by the cleaner from cottons stripped at mid-season than from the early and late-harvested cotton. This may be the cause of higher percentages of foreign matter being removed by the picker and cards in the spinning tests.

Table 15 shows that the Mebane 140 and Hi-Bred varieties, which have a short and coarse fiber, were consistently lower in the amounts of foreign matter removed in the spinning tests. Table 15 also shows that higher average percentages of foreign matter were removed from the stormproof varieties CA 122, CA 89A, Stormproof No. 1, Stormmaster and Macha Early than from the normal boll varieties. These differences can be largely attributed to the more difficult extracting qualities of the stormproof varieties and the good cleaning qualities of Mebane 140 and Hi-Bred.

Table 14. Average waste removed in spinning tests, the neps, strength and appearance of 22 yarn, and the maturity of the fiber in cotton machine-stripped with No. 15 machine at early, mid-season and late harvests at College Station, 1946-48

Variety	Percent of waste removed by picker and cards	22 yarn strength, lbs.	Neps in card web[1]	Appearance of 22 yarn	Percent of fiber maturity
Early harvest					
Deltapine 14	20.8	103.1	30 h[2]	C+	71
Stoneville 2B	23.8	102.4	46 vh[3]	C	66
Mebane 140	18.1	87.8	17 av[4]	B	74
CA 122	18.8	106.7	22 av	C+	72
CA 89A	20.5	98.7	37 h	C+	68
Average	20.4	99.7	30 h	C+	70
Mid-season harvest					
Deltapine 14	22.1	100.0	23 av	C+	72
Stoneville 2B	22.8	97.2	44 vh	C	65
Mebane 140	20.0	82.5	15 l[5]	B	71
CA 122	23.8	98.8	30 h	B	79
CA 89A	20.7	99.4	36 h	C+	68
Average	21.9	95.6	30 h	C+	71
Percent change from early harvest	+8.4	—4.3	.0	.....	+1.4
Late harvest					
Deltapine 14	22.9	98.7	23 av	C+	70
Stoneville 2B	21.6	93.0	24 av	C+	66
Mebane 140	21.3	79.7	20 av	B	75
CA 122	24.0	96.4	26 av	C+	71
CA 89A	18.0	101.7	28 h	C+	66
Average	21.6	93.9	24 av	C+	70
Percent change from early harvest	+5.9	—6.2	—25.0	.....	.....
Percent change from mid-season harvest	—1.4	—1.8	—25.0	.....	.....

[1]Per square 100 inches. [2]high. [3]very high. [4]average. [5]low.

Lubbock: No. 16 Machine. Five varieties of varying fiber and storm resistance qualities were selected from the 11 varieties harvested for the spinning and fiber tests. The first column of Table 16 shows that the foreign matter removed from cottons

Table 15. **Average waste removed in spinning tests, the neps, strength and appearance of 22 yarn and the maturity of the fiber in cotton machine-stripped with No. 15 machine at early, mid-season and late harvests at Lubbock, 1946-48**

Variety	Percent of waste removed by picker and cards	22 yarn strength, lbs.	Neps in card web[1]	Appearance of 22 yarn	Percent of fiber maturity
Early harvest					
Deltapine 14	14.7	105.2[3]	32 h[6]	C+	76
Stoneville 2B	16.6	104.5[3]	33 h	C+	72
Mebane 140	12.9	89.4[3]	15 l[7]	B	75
CA 122	19.1	98.5[3]	14 l	B+	77
CA 89A	19.1	96.0[3]	22 av[8]	B	72
Northern Star	16.7	110.8[4]	11 l	C+	71
Paymaster	14.5	103.4[4]	19 av	C+	78
Hi-Bred	14.9	85.3[4]	24 av	B	82
Stormproof No. 1	16.4	94.8[4]	17 av	B+	73
Stormmaster	21.1	101.5[4]	33 h	C+	72
Macha Early	20.2	105.9[4]	27 av	C+	72
Average	16.9	100.0	22 av	B—	74
Mid-season harvest					
Deltapine 14	17.0	100.0[4]	33 h	C	73
Stoneville 2B	19.4	97.2[3]	28 h	C+	72
Mebane 140	13.3	83.7[4]	18 av	B	78
CA 122	19.6	98.3[2]	34 h	B	68
CA 89A	17.4	100.5[4]	28 h	C+	70
Northern Star	19.6	109.2[4]	17 av	C+	79
Paymaster	18.4	100.2[4]	36 h	C	76
Hi-Bred	15.0	88.7[4]	15 l	C+	80
Stormproof No. 1	18.4	97.8[4]	25 av	B	70
Stormmaster	24.9	101.5[4]	21 av	C+	70
Macha Early	25.0	101.9[4]	22 av	C+	74
Average	18.9	98.1	25 av	C+	74
Percent change from early harvest	+11.8	—1.8	+13.6	.....	0.0
Late harvest					
Deltapine 14	15.5	97.2[4]	36 h	C	72
Stoneville 2B	18.7	96.4[3]	34 h	C	70
Mebane 140	13.5	85.9[3]	14 l	B	77
CA 122	18.1	97.0[2]	23 av	B	68
CA 89A	17.7	101.1[4]	28 av	C+	70
Northern Star	17.7	109.1[5]	21 av	C+	60
Paymaster	18.5	97.8[5]	40 h	C	74
Hi-Bred	15.3	88.8[5]	29 h	C+	74
Stormmaster	14.5	97.9[5]	31 h	B	68
Macha Early	20.5	107.3[5]	19 av	B	69
Average	19.6	103.4[5]	24 av	C+	69
Percent change from early harvest	17.2	98.4	27 av	C+	70
Percent change from mid-season harvest	+1.8	—1.1	+22.7	.....	+5.7
	—9.9	+0.7	+8.0	.....	+5.7

[1]Per 100 square inches. [3]1947 only [5]1948 only [7]Low
[2]1946 only [4]1946–1947 [6]High [8]Average

harvested at Lubbock with the No. 16 machine followed the same trends as shown for the No. 15 machine (Table 15). Higher percentages were removed from cotton harvested at mid-season than at the early and late harvests.

The lowest percentage of foreign matter removed from any one variety for all three harvest dates was from Mebane 140. The stormproof varieties CA 122 and CA 89A gave up higher percentages of foreign matter than did the normal boll varieties, Deltapine 14, Stoneville 2B and Mebane 140. The causes of these differences are apparently the same as given for the differences in the foreign matter removed for the cottons harvested with the No. 15 machine.

All the cotton harvested with the No. 16 machine gave up lower percentages of foreign matter in the spinning tests for

Table 16. Average waste removed in spinning tests, the neps, and strength and appearance of 22 yarn in cotton machine-stripped with No. 16 machine at early, mid-season and late harvests at Lubbock, 1946-47

Variety	Percent of waste removed by picker and cards	22 yarn strength, lbs.	Neps in card web[1]	Appearance of 22 yarn
Early harvest				
Deltapine 14	12.7	101.9	34 h[2]	C+
Stoneville 2B	12.0	102.2	27 h	C+
Mebane 140	10.6	86.4	14 l[3]	B
CA 122	18.9	101.0	27 h	C+
CA 89A	17.8	99.8	21 av[4]	B
Average	14.4	98.3	25 av	C+
Mid-season harvest				
Deltapine 14	16.0	99.2	22 av	B
Stoneville 2B	17.6	100.1	42 vh[5]	C
Mebane 140	13.3	85.6	14 h	B
CA 122	16.6	96.8	31 h	C+
CA 89A	16.9	100.0	39 h	C
Average	16.1	96.3	30 h	C+
Percent change from early harvest	+11.8	−2 1	+20.0	.....
Late harvest				
Deltapine 14	14.8	98.5	24 av	C+
Stoneville 2B	15.2	96.7	36 h	C+
Mebane 140	12.8	85.6	16 l	B
CA 122	15.5	98.7	34 h	C
CA 89A	17.1	102.1	26 av	B
Average	15.1	96.3	27 av	C+
Percent change from early harvest	+4.9	−2.1	+8.0	.....
Percent change from mid-season harvest	−6.6	.0	−11.1	.....

[1]Per 100 square inches. [2]High. [3]Low. [4]Average. [5]Very high.

all three harvests than did the cottons harvested with the No. 15 machine (Tables 15 and 16). There was no difference for Mebane 140 at the mid-season harvest.

These differences indicate clearly that where cotton is stripped and extracted before the foreign matter, particularly the fine trash, is worked into the fiber, that higher percentages of the foreign matter are removed in the extracting process.

GRADE OF MACHINE-STRIPPED COTTON

The grade of the machine-stripped cottons for each variety at the three harvests for College Station and Lubbock is shown numerically in Tables 8, 9 and 10.

College Station: No. 15 Machine. Table 8 shows the numerical grade for the cottons stripped at College Station early, mid-season and late. There was little difference in the average grade for the varieties harvested at early, mid-season and late dates, 7.8, 8.2 and 8.2, respectively. This is quite a low grade as 8.0 is strict good ordinary. The early-harvested cottons averaged .4 higher, or almost one-half grade, than the mid-season and late-harvested cottons.

CA 122, a stormproof strain, gave a grade from one-half to one grade higher than the average for all three harvest dates, while CA 89A, another stormproof strain, averaged one grade lower. This is attributed to better response to defoliation of the CA 122 than the CA 89A, and that there was less green leaf trash in the CA 122 cotton (Table 2).

Lubbock: No. 15 Machine. Table 9 shows the numerical average grade for the early harvested cottons was 7.6, (SGO+), while the mid-season harvest averaged 9.3, (GO—), and the late harvest averaged 8.6, (GO+).

At the early harvest, Hi-Bred gave the highest grade, 6.5 (LM+), while Stoneville 2B gave the lowest grade of 9.0 (GO). This is a difference of 2.5 grades between the lowest and highest grade. Hi-Bred is a good cleaning cotton while Stoneville 2B has poor cleaning qualities.

At the mid-season and late harvests, CA 122 graded 8.0 (SGO) and 7.5 (SGO+), respectively, the highest grade of all the varieties for these dates. Both Hi-Bred and Mebane 140 gave grades slightly higher than the average for mid-season and late harvests. Stoneville 2B, Deltapine 14, Northern Star and Paymaster gave grades, generally, lower than the average (Table 9).

Lubbock: No. 16 Machine. Table 10 shows that the average grade for each harvest with the No. 16 machine was one to two grades higher than the cotton harvested with the No. 15

machine. The average grade, where the cotton was harvested early, mid-season and late with the No. 16 machine, was 5.9 (SLM), 7.2 (LM) and 7.7 (SGO+), respectively, as compared with 7.6 (SGO+), 9.3 (GO—) and 8.6 (GO+), respectively, when harvested with the No. 15 machine. Each variety harvested with the No. 16 machine early and mid-season also graded higher than when harvested with the No. 15 machine (Tables 9 and 10). When harvested with the No. 15 machine at mid-season, 6 of the 11 varieties gave BG (below grade) grades, but when harvested with the No. 16 machine only one variety was below grade. At the late harvest, the cotton from three varieties graded BG when harvested with the No. 15 machine, while only one gave BG cotton when harvested with the No. 16 machine.

The grade differences show that the use of the field extractor resulted in higher grades at the early and mid-season harvests, and gave equal or better grades at the late harvest.

The grades shown in Table 10 indicate that when the harvest is late the foreign matter is more difficult to remove and the grade of the lint is lowered.

STAPLE LENGTH OF MACHINE-STRIPPED COTTON

Tables 8, 9 and 10 do not show any indication of injury to the staple, or that the staple is significantly affected by delaying the harvest until late in the season. The average staple length for each harvest is approximately the same. As expected, however, the average staple length at College Station for the same varieties is slightly longer than at Lubbock.

STRENGTH OF 22 YARN FROM MACHINE-STRIPPED COTTON

The lint samples were spun into 22 yarns after the foreign matter was removed by the picker and cards. Yarns were spun from samples for each of the 11 varieties harvested early, mid-season and late with the No. 15 machine at Lubbock. Where the cotton was harvested at Lubbock with the No. 16 machine, the same five varieties harvested at College Station with the No. 15 machine were selected for the spinning tests.

College Station: No. 15 Machine. The second column in Table 14 shows the strength of 22 yarn spun from five varieties harvested early, mid-season and late at College Station. The strength of the yarn for the early-harvested cotton was highest with an average of 99.7 pounds for the five varieties. The cotton harvested in mid-season produced a yarn having a strength of 95.6 pounds, while the late-harvested cotton produced a yarn having a strength of 93.9 pounds. Thus, the strength of the yarn decreased for the late-harvested cotton.

This trend is shown for Deltapine 14, Stoneville 2B, Mebane 140 and CA 122 but not for CA 89A as the yarn, for this variety became increasingly stronger for the mid-season and late harvests, or 98.7, 99.4 and 101.7 pounds, respectively.

Deltapine had the highest average yarn strength, 103.1, 100.0 and 98.7 pounds, respectively, for the three harvests, while the short-staple Mebane 140 had the weakest yarn for each of the three harvests, 87.8, 82.5 and 79.7 pounds, respectively (Tables 8 and 14). The strain CA 89A had the highest yarn strength of any variety at the late harvest.

Lubbock: No. 15 Machine. Table 15 shows that the average yarn strength for the 11 varieties harvested with the No. 15 machine at Lubbock was the lowest for the mid-season harvest. The late-harvested cotton produced a yarn that averaged slightly stronger than the mid-season cotton, but slightly weaker than the early harvested cotton. The average yarn strength for the three harvests were 100.0, 98.1 and 98.4 pounds, respectively.

As at College Station, the trend appeared to be that yarn from normal boll varieties became weaker, but the yarn from some of the stormproof varieties became stronger as the season advanced (Table 15).

The long staple cottons produced a stronger yarn than the short staple cottons (Tables 9 and 15). For example, Deltapine 14 had a staple length of 29, 32 and 29 thirty-seconds of an inch, respectively, for early, mid-season and late harvests, while Hi-Bred had a staple length of 26 for all three harvests (Table 9). The yarn strength for Deltapine 14 was 105.2, 100.0 and 97.2 pounds, respectively, while the yarn strength for Hi-Bred was 85.3, 88.7 and 88.8 pounds, respectively, or an average difference of 13.2 pounds (Table 15).

When the averages for all 11 varieties are considered, there is a greater difference in the yarn strength between varieties than between the harvest dates.

Lubbock: No. 16 Machine. The yarn strength data for the five varieties listed in Table 16 and the yarn strength data for these same varieties in Table 15 show that there is little difference in the average yarn strength where the cotton was harvested with the Nos. 15 and 16 machines.

The cotton from both machines received the same treatment, with the exception that the field extractor of the No. 16 machine removed almost 50 percent of the total foreign matter in the field.

APPEARANCE OF 22 YARN FROM MACHINE-STRIPPED COTTON

The fourth columns of Tables 14, 15 and 16 show the classification for the appearance of the 22 yarn. The grade of the yarn appearance is in letters, with "A" being the best and the descending letters of the alphabet being lower in grade.

College Station: No. 15 Machine. Table 14 shows that the average grade of yarn appearance for all three harvests was C+. The yarn spun from Mebane 140 cotton graded B for all three harvests, while Deltapine 14 and CA 89A graded C+. The yarn grade for Stoneville 2B and CA 122 ranged from C to B for the three harvests.

Lubbock: No. 15 Machine. The average grade for all varieties harvested with the No. 15 machine was B— at the early harvest and C+ for the mid-season and late harvests. The yarn appearance for Mebane 140, CA 122 and Stormproof No. 1 graded B for all three harvests. Northern Star and Macha Early graded C+ for the three harvests. Hi-Bred graded B at the early harvest and C+ for the mid-season and late harvests.

Lubbock: No. 16 Machine. The yarn appearance for the cottons harvested with the No. 16 machine averaged C+ for all three harvests. The average grade of yarn appearance for the same five varieties harvested with the No. 15 machine did not differ significantly from the average grade shown for the No. 16 machine.

The yarn from Mebane 140 graded B for all three harvests, while the yarn grade for the other varieties ranged from C to B with no definite trend between the harvests.

NEPS IN THE CARD WEB OF MACHINE-STRIPPED COTTON

The third columns of Tables 14, 15 and 16 show the average nep classification in the card web. The neps are classed as low (1 to 15), average (16 to 25), high (26 to 40) and very high (41 and above).

College Station: No. 15 Machine. The average neps for all varieties was 30 for the early and mid-season harvests and 24 for the late harvest (Table 14). Mebane 140 had the least neps, while Stoneville 2B had the highest quantity of neps for all three harvests.

Lubbock: No. 15 Machine. Table 15 shows that the average neps in the card web for al varieties was 22, 25 and 27, respectively, for the early, mid-season and late harvests. The neps were consistently low in the card web for Mebane 140 and Northern Star and rather consistently high for Deltapine

14 and Stoneville 2B. The quantity of neps for the other varieties fluctuated and did not follow a definite trend in the harvest dates.

Lubbock: No. 16 Machine. Table 16 shows a similar trend for the same varieties as Table 15. That is, the neps in the card web for Mebane 140 are consistently low while the neps in Deltapine 14 and Stoneville 2B are consistently high for all three harvests.

MATURITY OF FIBER IN MACHINE-STRIPPED COTTON

The fifth columns of Tables 14 and 15 show the fiber maturity for each variety harvested early, mid-season and late at College Station and Lubbock.

The percentage of mature fibers was slightly higher at Lubbock than at College Station. There was not enough difference between the average maturity of the fibers for all varieties for the three harvests to affect yarn strength and appearance significantly.

At College Station, the average fiber maturity was 70 percent at the early and late harvests and 71 percent at the mid-season harvest (Table 14). This table shows that Deltapine 14, Mebane 140 and CA 122 had the highest percentage of mature fiber at all three harvests, while Stoneville 2B and CA 89A had the lowest percentages.

At Lubbock, the average fiber maturity for all 11 varieties was 74 percent at the early and mid-season harvests and 70 percent at the late harvest.

Hi-Bred had the highest percentage of mature fibers at the early and mid-season harvests, 82 and 80, respectively, but dropped to 74 percent at the late harvest.

The percentage of fiber maturity was fairly consistent for most varieties at each of the three harvests and had little significant effect on the yarn strength, appearance and neps.

FOREIGN MATTER REMOVED FROM MACHINE-PICKED COTTON

The machine-picked cotton was harvested with a regular commercial cotton picking machine (Figure 3). The dates of harvest were approximately the same dates as for the machine-stripped cotton. Samples of machine-picked cotton were not obtained for Lubbock as a mechanical picker was not available at that location.

Foreign Matter Removed by the Cleaner

The samples of machine-picked cotton were not run through the extractor as they had few burs. Table 17 shows the percentages of three kinds of foreign matter removed from machine-picked samples. There were slight increases, for the mid-season and late harvests, in the average amount of motes, burs and stems, 1.6, 1.7 and 2.1 percent, respectively. A higher average percentage of fine trash was removed from the five varieties harvested at mid-season than at the early harvest. The lowest amount of fine trash was removed from the late-harvested cotton. The average percentage of dirt and sand decreased consistently for the mid-season and late harvests, 4.1, 3.0 and 2.7 percent, respectively, for the three dates. Dirt and sand were the main types of foreign matter removed that influenced the total average percentages of 8.1, 7.9 and 7.2, respectively, for the three harvests.

Table 17. Average percentages of different kinds of foreign matter removed by the cleaner from varieties of cotton machine-picked early, mid-season and late at College Station, 1947-48

Variety	Clean seed cotton	Motes, burs and stems	Fine trash	Dirt and sand	Invisible loss	Total percent foreign matter removed
Early harvest						
Deltapine 14	93.3	1.4	2.7	2.5	.1	6.7
Stoneville 2B	91.0	1.2	1.8	5.4	.6	9.0
Mebane 140	91.2	1.4	1.0	6.1	.3	8.8
CA 122	92.1	2.2	2.6	2.5	.6	7.9
Average	91.9	1.6	2.0	4.1	0.4	8.1
Mid-season harvest						
Deltapine 14	92.0	1.8	2.6	3.0	.6	8.0
Stoneville 2B	91.6	1.6	2.6	3.4	.8	8.4
Mebane 140	92.2	1.6	2.8	3.0	.4	7.8
CA 122	92.5	1.8	2.4	2.8	.5	7.5
Average	92.1	1.7	2.6	3.0	0.6	7.9
Percent change from early harvest	+.2	+6.2	+30.0	−36.7	.....	−2.5
Late harvest						
Deltapine 14	91.6	2.5	1.9	3.4	.6	8.4
Stoneville 2B	93.9	1.7	1.6	2.5	.3	6.1
Mebane 140	93.3	1.6	1.2	3.5	.4	6.7
CA 122	92.6	2.6	2.7	1.5	.6	7.4
Average	92.8	2.1	1.9	2.7	0.5	7.2
Percent change from early harvest	+1.0	+31.2	−5.3	−51.8	.....	−12.5
Percent change from mid-season harvest	+0.8	+23.5	−36.8	−11.1	.....	−9.7

The decrease in the amount of foreign matter removed, apparently, was due to there being less dirt and sand collected in the cotton. At the early harvest, Deltapine 14 was picked before rains had fallen on the open cotton, while Stoneville 2B and Mebane 140 were picked after the rain. Therefore, the amount of dirt and sand removed from Deltapine 14 was 2.5 percent, in comparison with 5.4 and 6.1, respectively, for Stoneville 2B and Mebane 140.

CA 122 contained less dirt and sand than Deltapine 14, Stoneville 2B and Mebane 140 for all three harvests. On the other hand, the stormproof varieties had relatively high percentages of motes and burs, and fine trash.

The data indicate that the amount of foliage and the condition of the open cotton as influenced by rains will affect the percentage of foreign matter collected in harvesting with the mechanical picker.

Table 18. **Average percentages of different kinds of foreign matter removed in ginning, the percentages of seed and lint, the grade and staple of cotton machine-picked early, mid-season and late at College Station, 1947-48**

Variety	Fine trash	Dirt and sand	Invisible loss	Total foreign matter loss	Seed	Lint	Grade	Staple
Early harvest								
Deltapine 14	.5	.2	.4	1.1	66.8	32.1	7.5	28
Stoneville 2B	.5	.5	.1	1.1	63.4	35.5	7.0	30
Mebane 140	.4	.2	.5	1.1	61.6	37.3	5.5	28
CA 122	.5	.2	.6	1.3	64.7	34.0	6.5	29
Average	0.5	0.3	0.4	1.2	64.1	34.7	6.6	28.8
Mid-season harvest								
Deltapine 14	.5	.2	.2	.9	61.8	37.3	7.2	28
Stoneville 2B	.4	.1	.4	.9	63.6	35.5	7.2	29
Mebane 140	.4	.2	.2	.8	61.8	37.4	7.0	27
CA 122	.6	.3	.7	1.6	64.3	34.1	7.0	28
Average	0.5	0.2	0.3	1.0	62.9	36.1	7.1	28.0
Percent change from early harvest	0.0	—50.0	—33.3	—20.0	—1.9	+4.0	—7.6	.....
Late harvest								
Deltapine 14	.6	.2	.5	1.3	63.0	35.7	7.5	28
Stoneville 2B	.4	.2	.5	1.1	67.8	31.1	7.5	28
Mebane 140	.5	.3	.6	1.4	61.3	37.3	7.0	26
CA 122	.5	.2	.6	1.3	64.8	33.9	7.0	28
Average	0.5	0.2	0.6	1.3	64.2	34.5	7.2	27.5
Percent change from early harvest	0.0	—50.0	+50.0	+8.3	+0.2	—0.6	—9.1	.....
Percent change from mid-season harvest	0.0	0.0	+100.0	+30.0	+2.1	—5.0	—1.4	.....

Foreign Matter Removed by Ginning

Table 18 shows that the amount of fine trash averaged the same for the five varieties at each harvest date, 0.5 percent. The amount of dirt and sand averaged 0.1 percent more for the early harvest than for the mid-season and late harvests. The total average amount of foreign matter, which included the invisible loss, was highest, 1.3 percent, for the late harvest and the lowest, 1.0 percent, for the mid-season harvest. The difference in the amount of foreign matter removed from varieties is so small that no conclusion can be drawn from them. The cleaning of the dirt and trash from the floor and experimental error could well account for the small differences.

Foreign Matter Removed in Spinning Tests

The first column in Table 19 shows that the percentages of foreign matter removed from the five varieties for the three

Table 19. Average percentages of foreign matter removed in spinning tests, the neps, strength and appearance of 22 yarn, and the maturity of the fiber in cotton machine-picked early, mid-season and late at College Station, 1947-48

Variety	Percent of foreign matter removed by picker and cards	22 yarn strength	Neps of card web[1]	Appearance of 22 yarn	Percent of fiber maturity
Early harvest					
Deltapine 14	15.8	105.8	24 av[2]	C+	69
Stoneville 2B	14.5	110.8	20 av	C+	76
Mebane 140	12.2	92.6	7 l[3]	B	74
CA 122	13.3	113.4	11 l	B	68
Average	14.0	105.6	16 l	B—	72
Mid-season harvest					
Deltapine 14	14.2	102.2	22 av	B	76
Stoneville 2B	12.7	106.8	28 h[4]	B	78
Mebane 140	13.0	89.4	19 av	B	79
CA 122	16.9	107.0	15 l	B	68
Average	14.2	101.4	21 av	B	75
Percent change from early harvest	+1.4	—4.1	+31.2	.....	—4.2
Late harvest					
Deltapine 14	14.1	101.9	14 h	C+	74
Stoneville 2B	15.4	100.4	16 av	C+	65
Mebane 140	13.4	83.7	8 l	B	74
CA 122	15.6	107.3	21 av	B	68
Average	14.6	98.3	15 l	B—	70
Percent change from early harvest	+4.3	—7.4	—6.7	.....	—2.8
Percent change from mid-season harvest	+2.8	—3.2	—40.0	.....	—7.1

[1]Per 100 square inches. [2]Average. [3]Low. [4]High.

harvests were 14.0, 14.2 and 14.6, respectively. There was a slight increase in the foreign matter removed at the two later harvests. The increase, however, is so small that no conclusion can be drawn.

The lowest percentage of foreign matter was removed from Mebane 140 for the early and late harvests, while Stoneville 2B gave up the least amount at the mid-season harvest. CA 122 gave up the highest percentage at the early harvest.

These differences may indicate the amount of foreign matter left in the seed cotton in cleaning and also that there is a difference in the cleaning qualities of the varieties.

GRADE OF MACHINE-PICKED COTTON

Table 18 shows the numerical grade for four varieties of machine-picked cotton at College Station. The average grades at the early, mid-season and late harvests were 6.6 (LM+), 7.1 (LM) and 7.2 (LM), respectively.

The early-harvested cotton averaged about one-half grade higher than the cotton harvested at mid-season and late. There was only a slight difference in the average grade of the cottons at mid-season and late harvests.

At the early harvest, Mebane 140 was one grade higher, 5.5 (SLM+) than the next best grade for CA 122, 6.5 (LM+). Deltapine 14 and Stoneville 2B gave grades of 7.5 (SGO+) and 7.0 (LM), which were one to two grades lower than Mebane 140 and CA 122.

There was little difference in the grades for each of the varieties at the mid-season and late harvests (Table 18).

APPEARANCE OF 22 YARN FROM MACHINE-PICKED COTTON

The fourth column of Table 19 shows the appearance of 22 yarn spun from machine-picked cotton at College Station. The average grades of the yarns for the early, mid-season and late harvests were B—, B and B—, respectively. Deltapine 14 and Stoneville 2B graded C+ at the early and late harvests. Therefore, there were no significant differences in the appearance of the yarns for the varieties for the three harvest dates.

The yarn from machine-picked cotton graded slightly higher than that from the machine-stripped cotton, or B— for the former and C+ for the latter, for the early and late harvests (Table 14 and 19).

STAPLE LENGTH OF MACHINE-PICKED COTTON

The average staple length of the machine-picked cotton became slightly shorter at the late harvest. This trend was noticeable for all varieties except Deltapine 14 which had the same staple length for each of the three harvests (Table 18). The difference in staple length is so slight that it cannot be considered significant.

When the average staple length of the machine-stripped cottons shown in Table 8 is compared with the staple length of the machine-picked cottons in Table 18, it is seen that the former are about one-thirty-second of an inch longer than the latter, for all three harvests. This difference may be attributed to the extractor throwing out a high percentage of the hard, knotty, partially-open bolls.

Tables 14 and 19 show that the machine-picked cotton had a slightly higher percentage of mature fibers at the early and mid-season harvests than the machine-stripped cotton. There was no difference in the average maturity of the fibers for the two methods of harvest at the late harvest.

These data, therefore, are not conclusive enough to explain these slight differences in staple length between machine-picked and machine-stripped cottons.

NEPS IN CARD WEB AND MATURITY OF FIBER IN MACHINE-PICKED COTTON

The third and fifth columns in Table 19 show neps in the card web and the percentage of mature fibers in machine-picked cotton. The average neps per square inch of card web was low for the early and late harvests and average for the mid-season harvest.

The average percentage of mature fibers was 72, 75 and 70, respectively, for the early, midseason and late harvests.

As the number of neps and the percentage of mature fibers followed no definite trend, no conclusions can be drawn from these data.

ACKNOWLEDGMENTS

The authors wish to express their appreciation to Deere and Company for the loan of the cotton strippers used at both College Station and Lubbock; to the International Harvester Company for picking the samples of machine-picked cotton at College Station; and to the Cotton Testing Laboratory, Production and Marketing Administration, U. S. Department of Agriculture at College Station, for making the spinning and fiber tests.

SUMMARY AND CONCLUSIONS

Cotton was mechanically harvested with strippers at both College Station and Lubbock. The stripper at Lubbock was used with and without an extractor. A mechanical picker was used only at College Station.

Cotton was harvested on dates considered early, mid-season and late for the location. The late harvest at College Station was usually made before the earliest harvest at Lubbock.

Samples of the machine-stripped cotton were extracted. The foreign matter was removed and separated into four classes, burs, stems, fine trash, and dirt and sand. The percentage of each class was calculated against the weight of the original sample.

The seed cotton from the extracting process was cleaned. The foreign matter was removed and separated into three classes, motes, burs and stems; fine trash; and dirt and sand. The percentage of each class was calculated against the weight of the seed cotton sample.

The foreign matter was collected after ginning each sample and was separated into two classes, fine trash, and dirt and sand. The percentage of each class was calculated against the weight of the clean seed cotton.

The foreign matter removed in the spinning tests was calculated against the weight of the lint samples. This sample did not always consist of all the lint ginned.

Foreign matter from the machine-picked cotton was handled similar to the machine-stripped cotton. This cotton, of course, was not run through the extractor.

At College Station, the early harvested stripped cotton contained more foreign matter than did cottons harvested in mid-season and late. This was due to poor defoliation at the early harvest. The average total percentages of foreign matter removed from five varieties by the extractor at College Station for the early, mid-season and late harvests were 39.4, 36.5 and 36.4, respectively. The average percentage of burs and stems remained fairly constant for the three harvests while the fine trash decreased and the dirt and sand increased as the harvest was deferred.

At Lubbock, the average total percentages of foreign matter removed from 11 varieties where the cotton was harvested with the No. 15 stripper, which was not equipped with a field extractor, were 21.4, 25.4 and 28.2, respectively, for early, mid-season and late harvests. The stems in the cotton stripped with the No. 15 machine increased 175 percent and the dirt and sand increased 209 percent from the early to the late harvest. The stormproof varieties, generally, gave up less total percentages of foreign matter than the normal boll varieties.

Where the No. 16 cotton stripper, equipped with a tractor-mounted field extractor, was used, the total foreign matter removed averaged less than half that removed from cotton stripped with the No. 15 machine. There was a 500 percent increase in the amount of stems in the No. 16 machine-stripped cotton from the early to the late harvest.

The results show that the amount of stems, dirt and sand, and total foreign matter removed from machine-stripped cotton increases greatly when the harvest is delayed until the plants have become dry and brittle and the wind has blown dirt and sand into the open, fluffy locks.

Foreign matter removed by the cleaner from cotton stripped at College Station decreased at the later harvests, which had better defoliation.

At Lubbock, in cotton harvested with the No. 15 machine, the average total percentages of foreign matter removed by the cleaner for the early, mid-season and late harvests were 7.0, 6.5 and 8.4, respectively. The late stripped cotton gave up 20 percent more foreign matter than did the early stripped cotton.

The greatest increase in the kind of foreign matter removed by the cleaner from cottons stripped with the No. 15 machine was in dirt and sand. From the early to the late harvests, the amount of dirt and sand removed by the cleaner increased 166 percent.

Higher percentages of foreign matter were removed by the cleaner from the normal boll than from the stormproof types of cotton.

Only 0.7 percent less foreign matter was removed by the cleaner from cottons harvested with the No. 16 machine than from the No. 15 machine at the early and mid-season harvests, and 3.4 percent less for the late harvest.

The foreign matter removed in ginning varied so little between harvest dates, varieties, types of machines and locations that the differences were not considered significant, especially since the samples were ginned with a single-breasted 20-saw gin.

The average total foreign matter removed in extracting, cleaning and ginning cottons machine-stripped at College Station for the early, mid-season and late harvests were 46.5, 42.9 and 41.1 percent, respectively, of the original stripped sample. Burs comprised most of the foreign matter removed by the extractor.

At Lubbock, the average total percentages of foreign matter removed from the original sample in extracting, cleaning and ginning cottons stripped with the No. 15 machine for the three harvests were 28.2, 31.1 and 34.6, respectively.

The average percentages of foreign matter removed from cottons harvested with the No. 16 machine at Lubbock, in extracting, cleaning and ginning, were 15.6, 19.2 and 17.5, respectively, for the three harvests. Less waste was removed from cottons stripped at Lubbock with the No. 15 machine than from cottons stripped at College Station with the same machine.

There was no apparent significant difference in the average foreign matter removed by the picker and cards in preparation for spinning for the three harvests at College Station, as the average percentages were 20.4, 21.9 and 21.6, respectively, of the lint sample.

The average percentages of waste removed by the picker and cards from the cottons stripped with the No. 15 machine at Lubbock were 16.9, 18.9 and 17.2, respectively, for the early, mid-season and late harvests. There was only .3 percent more waste removed by the picker and cards from the late harvested cotton than the early harvested cotton. Cottons stripped with the No. 16 machine followed the same trend in picker and card waste as shown for the No. 15 machine.

Higher average percentages of waste were removed at Lubbock by the picker and cards from the stormproof than from the normal boll types of cotton.

The short-staple varieties were consistently low in the amounts of picker and card waste removed in the spinning tests where cotton was machine-stripped.

At both College Station and Lubbock, the average strength of 22 yarn in most varieties became weaker at the late harvest. The yarn from the stormproof strain, CA 89A, however, became stronger as the harvest was delayed. The average strengths of the CA 89A yarn at College Station for the three harvest dates were 98.7, 99.4 and 101.7 pounds, respectively. The strengths of the CA 89A yarn at Lubbock for the No. 15 stripped cotton were 96.0, 100.5 and 101.1 pounds, respectively, and for the No. 16 stripped cotton were 99.8, 100.0 and 102.1 pounds, respectively.

The 22 yarn spun from the long staple cottons was stronger than the yarn spun from the short staple cottons. Deltapine gave yarn strengths of 105.2, 100.0 and 97.2 pounds, respectively, while Hi-Bred gave yarn strengths of 85.3, 88.7 and 88.8 pounds, respectively, for the three harvests.

The appearance of the 22 yarn spun from the short staple cottons was generally slightly better than from the long staple cottons.

The neps in the card web for Mebane 140 was consistently low for all varieties and dates of harvest for both locations.

The average grade of the machine-stripped cottons at College Station was approximately strict good ordinary for all three harvests.

At Lubbock, where the cotton was harvested with the No. 15 machine, the average grades for the three harvests were SGO+, GO— and GO+, respectively. At the early harvest, Hi-Bred gave the highest grade of LM+, while Stoneville 2B gave the lowest grade of GO.

Where the cotton was stripped with the No. 16 machine, the average grades of the cotton for the three harvests were SLM, LM and SGO+, respectively.

The grade differences show that the use of the field extractor resulted in higher grades at the early and mid-season harvests, and gave equal or better grades at the late harvest.

The data do not indicate any injury to the staple by delaying the harvest until late in the season.

The average maturity of the fiber was approximately 70 percent for all harvests of the machine-stripped cotton at both College Station and Lubbock.

The total average percentages of foreign matter removed by the cleaner from machine-picked cotton at College Station, where the cotton was poorly defoliated, were 8.1, 7.9 and 7.2, respectively for the early, mid-season and late harvests.

The decrease in the amount of foreign matter reflects the effect of better defoliation at the later harvests.

The amount of foreign matter removed in ginning machine-picked cotton averaged about the same as that removed in ginning machine-stripped cotton.

The waste removed by the picker and cards in the spinning tests of machine-picked cotton averaged 14.0, 14.2 and 14.6 percent, respectively, for the early, mid-season and late harvests. The comparable amounts removed in the spinning tests for machine-stripped cotton were 20.4, 22.2 and 22.4, respectively, or about 8 percent more from the machine-stripped cotton.

The strength of the 22 yarn spun from the machine-picked cotton was slightly stronger than that spun from the machine-stripped cottons at College Station.

There was little difference in the appearance of the yarn from machine-picked cotton and the machine-stripped cottons at College Station.

The machine-picked cottons at College Station averaged one-half to one and one-half grades higher than the same varieties when machine-stripped.

There was no significant difference in the staple length of the machine-picked and the machine-stripped cottons.